THE PHILIPPINE JOURNAL OF SCIENCE

VOLUME 27

MAY TO AUGUST, 1925

WITH 29 PLATES AND 17 TEXT FIGURES

MANILA
BUREAU OF PRINTING
1925

210874

EDITORIAL BOARD

WILLIAM H. BROWN, PH.D., *Editor*

R. C. MCGREGOR, A.B., *Associate Editor*

ALBERT H. WELLS, A.B.; GRANVILLE A. PERKINS, PH.D.; A. P. WEST, PH.D.
T. DAR JUAN, A.B., PHAR.D.; F. AGCAOILI, A.B.; A. S. ARGÜELLES, B.S.
Chemistry

VICTORIANO ELICAÑO, B.S.; LEOPOLDO A. FAUSTINO, E.M., PH.D.
Geology

H. W. WADE, M.D.; OTTO SCHÖBL, M.D.
F. G. HAUGHWOUT; STANTON YOUNGBERG, D.V.M
Experimental Medicine

LIBORIO GOMEZ, M.D., PH.D.; F. CALDERON, B.A., L.M.
VICENTE DE JESUS, M.D.
Clinical Medicine

C. F. BAKER, M.A.; L. M. GUERRERO, PHAR.D.
Botany

ALBERT C. HERRE, PH.D.; C. F. BAKER, M.A.
LEOPOLDO B. UICHANCO, M.S.; SC.D.; W. SCHULTZE
Zoölogy

H. O. BEYER, M.A.; OTTO JOHNS SCHEERER, M.A.
Anthropology

ANNA B. BANYEA, *Copy Editor*

CONTENTS

No. 1, May, 1925

[Issued May 27, 1925.]

Page

KUSAMA, HIROSHI. A note on the viability of Bacillus dysenteriae.... 1

CALLENDER, G. R. and THEODORE BITTERMAN. An epidemiological study in leprosy.... 9

MERRILL, ELMER D. New species of Philippine plants collected by A. Loher 21

HAYASAKA, I. Magellania dickersoni, a new species of brachiopod.... 61
One plate and one text figure.

MOSER, J. New Philippine Cetoniidæ.... 69

ALEXANDER, CHARLES P. New or little-known Tipulidæ from the Philippines (Diptera), Part II.... 71

GAHAN, A. B. A second lot of parasitic Hymenoptera from the Philippines 83
One plate.

FRISON, THEODORE H. The bumblebees of the Philippine Islands (Bremidae: Hymenoptera) 113
One plate.

SPAETH, FRANZ. Zwei neue Cassida-Arten aus den Philippinen.... 125

GEBIEN, HANS. Die Tenebrioniden (Coleoptera) des indo-malayischen Gebietes, unter Berücksichtigung der benachbarten Faunen, IV. Die Gattungen Phloeopsidius, Dysantes, Basanus, und Diaperis 131
One plate.

BAKER, C. F. Nomemclatorial notes on the Jassoidea, III.... 159

No. 2, June, 1925

[Issued July 13, 1925.]

MERRILL, ELMER D. Five new species of Chinese plants.... 161

HERRE, ALBERT W. C. T. A supplement to poisonous and worthless fishes 167

COCKERELL, T. D. A., and NORMA LE VEQUE. Bees from Samar, Philippine Islands 169

PATTON, W. S. Diptera of medical and veterinary importance, I. Types of older authors in continental museums.... 177

MUIR, F. The genus Andes Stål (Cixiidae: Homoptera).... 201
Two plates.

Page

SCHWARTZ, BENJAMIN. Helminth parasites of hogs in the Philippine Islands 227
Two plates.

SCHULTZE, W. Macroxenos piercei (order Strepsiptera), a new genus and species of wasp parasites of the Philippine Islands.... 235
One plate.

LEE, H. ATHERTON. The comparative resistance to foot rot of various citrus species as root stocks..... 243
One plate and one text figure.

GEBIEN, HANS. Die Tenebrioniden (Coleoptera) does indo-malayischen Gebietes, unter Berücksichtigung der benachbarten Faunen, V. Die Gattung Ceropria..... 257
One plate.

No. 3, July, 1925

[Issued August 3, 1925.]

HERRE, ALBERT W. C. T. A new Philippine sea robin, family Peristediidae 291
One plate.

TAYLOR, EDWARD. Notes on the chlorination of the Manila water supply 297
Two plates and two text figures.

SCHÖBL, OTTO, and JOSE RAMIREZ. The fallacy of the test for lactose fermenters as an indicator of fæcal pollution of waters.... 317

SUMULONG, MANUEL D. Effects of castration in immature guinea pigs 325
Four text figures.

DE LEON, WALFRIDO, and LAMBERTO LEIVA. Echinococcus cyst of the human lung 351
Nine plates and three text figures.

HUSTACHE, A. Curculionides nouveaux des Philippines et l'Orient.... 371

PATTON, W. S. Diptera of medical and veterinary importance, II. The more important blowflies, Calliphorinae..... 397

FERRIS, G. F. Third report upon Diptera Pupipara from the Philippine Islands 413
Five text figures.

GEBIEN, HANS. Die Tenebrioniden (Coleoptera) des indo-malayischen Gebietes, unter Berücksichtigung der benachbarten Faunen, VI. Die Gattungen Ischnodactylus, Hoplocephala, und Martianus 423
Two plates.

No. 4, August, 1925

[Issued September 4, 1925.]

RODRIGUEZ, JOSE N. The disturbances of cutaneous sensibility in leprosy 455
One text figure.

MANALANG, C. A hookworm campaign in Cebu..... 483

Page

SCHWARTZ, BENJAMIN, and ELOISE B. CRAM. Horse parasites collected in the Philippine Islands 495
Three plates.

HERRE, ALBERT W. C. T. Two strange new fishes from Luzon 507

KREKICH-STRASSOLDO, H. Anthicidæ of the Philippines, I 515

BAKER, C. F. Nomenclatorial notes on the Jassoidea, IV 537

GEBIEN, HANS. Die Tenebrioniden (Coleoptera) des indo-malayischen Gebietes, unter Berücksichtigung der benachbarten Faunen, VII. Die Gattung Platydema Castelnau und Brulle 539
One plate.

INDEX 597

210874——11

THE PHILIPPINE JOURNAL OF SCIENCE

VOL. 27 MAY, 1925 No. 1

A NOTE ON THE VIABILITY OF BACILLUS DYSENTERIÆ [1]

By HIROSHI KUSAMA

Of the Central Health Bureau, Tokyo, Japan

The present study was initiated for two reasons: First, to obtain information as to the viability of *Bacillus dysenteriæ* outside the human body; second, to search for a medium by means of which the stools of dysentery patients or carriers could be preserved and the detection of bacillary dysentery be made easier. Kolle and Hetsch [2] state that the resistance of *B. dysenteriæ* outside the body is not very great. Dried on various objects, the dysentery bacilli do not survive longer than eight to ten days; in a wet medium they remain viable for several months. Direct sunshine kills them in thirty minutes. The nontoxic strains, being more resistant than the toxic strains, are viable for several months in culture media. Winter [2] found *B. dysenteriæ Y*, dried on cloth, viable for one hundred fifty days. In symbiosis with *B. dysenteriæ* Shiga the nontoxic types outlive the Shiga type.

The study of the viability of the intestinal pathogenic bacteria supplies information necessary to the epidemiologist for the study of outbreaks under local conditions; it may help to explain certain regularity or periodicity of outbreaks and enable the sanitarian to take rational measures to prevent an outbreak from spreading beyond his control.

[1] The experiments were conducted in the Serum Laboratory, Bureau of Science, Manila, P. I.

[2] Die Experimentelle Bakteriologie und die Infektions-Krankheiten, Urban & Schwarzenberg, Berlin and Vienna, 6th ed. 1 (1922) 376.

As far as the bacteriologic diagnosis of bacillary dysentery is concerned we find in Teague's methylene blue-eosin lactose agar a differential medium of great help, but we lack an enrichment process which would enable us to detect with comparative ease small numbers of *B. dysenteriæ*. We find, therefore, that in a fresh stool of an early case there is little difficulty in isolating the microbe, whereas stools that are examined some time after they have been passed or stools from convalescents rarely give satisfactory results. This is due not only to the great bacteriophage susceptibility of *B. dysenteriæ*, but also, frequently, to the effect of symbiosis with other intestinal bacteria, particularly *B. coli*.

Owing to the great variety of the representatives of the *B. dysenteriæ* group and to the constant association in stools of *B. dysenteriæ* with *B. coli* (which apparently is more resistant to all adverse conditions than *B. dysenteriæ*), the realization of our hope of possessing as simple and reliable a bacteriologic diagnostic method for the detection of bacillary dysentery as that for the detection of cholera is very remote and the search for dysentery carriers, both convalescent and contact, is still fraught with the greatest difficulties.

EXPERIMENTS ON THE VIABILITY OF BACILLUS DYSENTERIÆ

The arrangement of the viability experiments of *B. dysenteriæ* was as follows:

Viability of culture:
- In water.
- In salt solution.
- In bile.
- In glycerine solution.
- In acid and alkaline bouillon.
- Resistance to drying.

Viability of *B. dysenteriæ* in stool:
- Normal artificial stool.
- Sterilized artificial stool.
- Resistance to drying in stool.
- Natural dysenteric stool.

CULTURE

In water.—The culture used in these experiments was one that had been isolated recently from a case of acute bacillary dysentery and corresponded to the Shiga type. Two large sterile test tubes, one containing 10 cubic centimeters of sterile distilled water and the other 10 cubic centimeters of sterile tap water, were inoculated with one loopful of twenty-four-hour-old agar

culture of the above-mentioned strain. The contents were then well stirred, and transplants from the tubes onto acid agar slants were made immediately and every third day thereafter. The tubes containing *B. dysenteriæ* suspended in water were allowed to stand at room temperature, protected from direct sunshine. The results of this experiment are shown in Table 1.

In salt solution.—The culture used in this experiment was the same as the one used in the previous one. In a series of test tubes decreasing dilutions of concentrated sodium chloride solution were placed. The total volume of each tube was 1 cubic centimeter. One loopful of a twenty-four-hour-old agar culture was emulsified in each of the tubes, stirred well, and allowed to stand at room temperature, protected from direct sunshine. Subcultures were made immediately and every three to four days thereafter. The results of this experiment are presented in Table 1.

In bile.—The same culture and arrangement were used as in the previous experiments except that bile was used instead of the salt solution. Due to evaporation the bile solution dried completely in seventy-seven days and *B. dysenteriæ* could not be isolated after that date. (See Table 1.)

In glycerine.—The same technic and culture were used in this experiment as in the previous one. The details and results are shown in Table 1.

In acid and alkaline bouillon.—Two tubes containing 10 cubic centimeters of acid bouillon +1, two tubes containing 10 cubic centimeters of +0.3 bouillon, and two tubes containing neutral bouillon were inoculated with the above-mentioned culture of *B. dysenteriæ* (Shiga type) and allowed to stand in the incubator at 37° C. Transplants were made immediately and at definite intervals. Similarly, a series of alkaline bouillon was planted. One tube of +0.3 bouillon, one tube of neutral bouillon, and one tube of −0.3 bouillon were planted with *B. dysenteriæ* (Flexner type) and included in this experiment. The details and results are to be seen in Table 1.

Resistance to drying.—Strips of filter paper (3 centimeters by 1 centimeter) were placed in sterile Petri dishes, soaked well with an emulsion of *B. dysenteriæ* (Shiga type), and dried in vacuo at room temperature over calcium chloride. As soon as the paper strips were dried, and every third day thereafter, a small square of the paper was cut off by means of sterile scissors and forceps and placed in a tube containing meat broth and incubated twenty-four to forty-eight hours. The growth that

took place in the tube was identified by the addition of 0.1 cubic centimeter of antidysenteric serum. For the results, see Table 1.

As far as viability of *B. dysenteriæ* in pure cultures is concerned, we find that—

1. *Bacillus dysenteriæ* survives longer in tap water than in distilled water, but neither in distilled water nor in tap water does it survive as long as *B. coli*.

2. Glycerine has a pronounced antiseptic effect on *B. dysenteriæ* and *B. coli* in high concentration. In higher dilutions glycerine is about equally effective a preservative for *B. coli* as for *B. dysenteriæ*.

3. Bile proved to be an excellent preservative for *B. dysenteriæ* and *B. coli* and very useful in preservation of stock cultures of *B. dysenteriæ*.

4. Dried in vacuo, *B. coli* proved to be more resistant than *B. dysenteriæ*.

5. *Bacillus coli* proved to be more resistant to alkaline reaction than *B. dysenteriæ*, which survived a considerable time in acid bouillon but died quickly in alkaline medium.

VIABILITY OF BACILLUS DYSENTERIÆ IN STOOL

Normal artificial stool.—About 2 grams of fresh normal fæces were emulsified in 10 cubic centimeters of normal salt solution, stirred well, and filtered through cotton to remove the large particles. One loopful of a twenty-four-hour-old agar culture of *B. dysenteriæ* was emulsified in this suspension. Transplants were made at intervals; the details and results are evident from Table 2.

Sterilized artificial stool.—A stool emulsion was prepared in the same way as described in the preceding experiment, with the exception that the stool emulsion was heated for thirty minutes at 100° C. and then cooled and inoculated. The results can be seen from Table 2.

Resistance to drying in stool.—Fresh normal and fresh sterilized stool emulsions were prepared in the same manner as described above. *Bacillus dysenteriæ* (Shiga) and *B. coli* emulsions were prepared also, in the same way as mentioned above. Mixtures of bacterial emulsions and of stool emulsions were made and strips of filter paper were impregnated with these mixtures. The saturated strips of paper were then dried rapidly in vacuum over calcium chloride. Immediately, and every two days thereafter, small pieces of the impregnated and dried papers were placed in tubes of bouillon and incubated at 37° C.

At the end of twenty-four hours incubation Teague's methylene blue-eosin plate was inoculated from each of the bouillon cultures. Suspicious colonies were fished out, transplanted, and identified by means of serum and sugar reactions. Further details and the results are evident from Table 2.

Natural dysenteric stool.—A series of stools from early suspected cases of dysentery was used in the following experiments. The stools were received partly in the natural state and partly diluted with alkaline peptone water because examination for cholera was also requested. This fact accounts for the alkaline reactions registered in the brief protocols given below of stools 2, 8, and 9.

Stool No. 2.—Liquid stool containing mucus and blood. Reaction, alkaline to litmus. *Bacillus dysenteriæ* (Flexner type) was isolated from this stool. Suspension of this stool was made and the viability of *B. dysenteriæ* studied in the following media: Physiologic salt solution, distilled water, tap water, +1 per cent bouillon, −1 per cent bouillon, and 50 per cent bile salt solution. About 2 grams of the stool sample were emulsified in 10 cubic centimeters of each medium mentioned. The stool sample as received was included for control. Furthermore, part of the stool suspension in distilled water was dried on filter paper in vacuo over calcium chloride. Immediately, and on alternate days thereafter, a loopful of the various emulsions was streaked on Teague's medium and a small strip of the dried stool on filter paper was planted in bouillon and plated on Teague's medium. Further identification of *B. dysenteriæ* was carried out in the same manner as described above. The details and results are evident from Table 3.

Stool No. 8.—Liquid stool containing mucus and blood. Reaction, acid to litmus. Specimen more than twenty-four hours old when received. *Bacillus dysenteriæ* (Shiga type) was isolated from this stool.

Stool No. 9.—Liquid stool containing mucus. Reaction, acid to litmus. *Bacillus dysenteriæ* (Shiga type) was isolated from this specimen. (See Table 3.)

From the experiments on the viability of *B. dysenteriæ* in artificial and natural dysenteric stools the following conclusions can be drawn:

1. Unlike the vibrio of cholera, *B. dysenteriæ* is fairly resistant to drying. It will survive longer in a sterile than in a normal fresh stool.

2. *Bacillus dysenteriæ* will survive a considerable length of time in water. In salt solution, and consequently in sea water, it will survive longer than in tap or distilled water.

3. Physiological salt solution and bile are favorable media for the survival of *B. dysenteriæ* in the stool and the combination of the two may help to preserve *B. dysenteriæ* in the stools of dysentery patients and carriers, in at least a certain percentage of cases.

Thanks are due to Dr. Otto Schöbl, Bureau of Science, for assistance in the preparation of this paper.

TABLE 1.—*Results of viability tests of Bacillus dysenteriæ and B. coli, separately, in various media.*

Medium.	*B. dysenteriæ* survived—	*B. coli* survived—
	Days.	*Days.*
Distilled water	18	69
Tap water	27	61
Glycerine:		
100 per cent	(a)	7
50 per cent	4	6
25 per cent	10	20
12.5 per cent	30	27
6.25 per cent	42	42
Sodium chloride solution:		
100 per cent	(a)	3
50 per cent	(a)	3
25 per cent	4	10
12.5 per cent	10	17
6.25 to 0.1 per cent	40	27–36
Ox bile in salt solution: [b]		
50 per cent	70	70
25 per cent	70	70
12.5 per cent	70	70
6.25 per cent	70	70
3.125 per cent	70	70
Bouillon:		
+1 (37° C.) Shiga	70	0
—1 (37° C.) Shiga	4	0
+0.3 (37° C.) Shiga	63	0
—0.3 (37° C.) Shiga	2	0
Flexner dysentery:		
+0.3	63	0
—0.3	1	0
Bacillus dysenteriæ + dried on paper (28° C.) Shiga	16	77

[a] Not found.

[b] Present until it dried completely.

TABLE 2.—*Results of viability experiments with Bacillus dysenteriæ and B. coli in normal fresh stool and normal sterilized stool.*

Stool.	Salt solution.	Bile, 50 per cent.	Stool inoculated with—		*B. dysenteriæ* survived—	*B. coli* survived—
			B. dysenteriæ.	*B. coli.*		
					Days.	*Days.*
Normal fresh	+	0	+	0	3	>6
Do	+	+	+	0	5	>6
Normal sterilized	+	0	+	0	66	0
Do	+	+	+	0	75	0
Do	+	0	+	+	15	>21
Do	+	+	+	+	17	>21
Normal fresh inoculated and dried in desiccator	0	0	+	0	3	21
Normal sterilized inoculated and dried in desiccator	0	0	+	0	12	0

TABLE 3.—*Viability of Bacillus dysenteriæ and B. coli in dysenteric stools placed in various media.*

Stool No.	Reaction to litmus.	Type of *Bacillus dysenteriæ* isolated.	Stool.		Salt solution.		Water.	
			B. dysenteriæ.	*B. coli.*	*B. dysenteriæ.*	*B. coli.*	*B. dysenteriæ.*	*B. coli.*
2	—	Flexner	1	>16	9	>16	7	>16
8	+	Shiga	4	>6	3	>6	0	0
9	+	do	2	>6	4	>6	0	0

Stool No.	Tap water.		Bouillon.				Bile, 50 per cent.		Dried in desiccator.	
			+1		—1					
	B. dysenteriæ.	*B. coli.*	*B. dysenteriæ.*	*B. coli.*	*B. dysenteriæ.*	*B. coli.*	*B. dysenteriæ.*	*B. coli.*	*B. dysenteriæ.*	*B. coli.*
2	7	>16	9	>16	7	>16	7	>16	7	11
8	0	0	0	0	0	0	4	>6	------	------
9	0	0	0	0	0	0	6	>6	------	------

AN EPIDEMIOLOGICAL STUDY IN LEPROSY [1]

By G. R. CALLENDER [2]

Major, Medical Corps, United States Army

and

THEODORE BITTERMAN [2]

Captain, Medical Administrative Corps, United States Army

The methods of transmission of leprosy have, thus far, not been satisfactorily ascertained, largely because of difficulty in finding a susceptible animal and in growing the organism.

Epidemiological studies have been made, based on statements obtained from the patients themselves, and by studying their surroundings; but, though some of the results are sufficiently suggestive to give rise in the minds of many students of leprosy to actual belief with reference to the means of transmission, there have been no reports sufficiently definite or covering a sufficient number of cases to warrant any assumption of positiveness.

It was proposed in 1923, as a part of the plan for leprosy investigation in the Philippines, to study the disease from the epidemiological standpoint and we agreed to begin the work and, after finding the method that should appear the most profitable to follow from this standpoint, to instruct a group of workers and to compile the results and coördinate efforts in this direction.

[1] The data on which this study is based were obtained at San Lazaro Hospital, the contagious-disease hospital of the Philippine Health Service in Manila. Practically all of the cases hospitalized for leprosy in that institution at the time the survey was made were interviewed to obtain this material. We wish to express our sincere appreciation to Dr. Vicente de Jesus, Director of Health, for the opportunity to do this work, and to the officers of San Lazaro Hospital for their courtesy and assistance. We also acknowledge our indebtedness to the patients in the leper department who acted as interpreters, and especially to Mr. Reyes, our chief interpreter, who also attended to the collection of the patients and tabulation of the lists.

[2] Member, United States Army Medical Department Research Board, Bureau of Science, Manila.

Because of the difficulty in finding suitable personnel in the Philippine Health Service who could be spared to undertake the work only a preliminary study was made and it forms the subject of this paper. It is believed that it suggests the advisability of continuing such a study until a much larger group has been covered, as the number of cases on which this paper is based is manifestly too small to warrant conclusions. It is believed, however, that such figures as appear may be utilized with others, by combination, to build up larger series.

No reference will be made here to the studies that have been published in the past, as this small addition does not justify such reference without a complete review of the work along this line to date. This we are unable to undertake at the present time.

It is said that all morphine habitués are liars. On somewhat the same principle, particularly in a land where segregation of lepers is practiced, it is extremely difficult to obtain reliable information as to onset and family history. The reasons are many and will bear citation or re-citation. Even in India, where compulsory segregation is not practiced to any extent, it is difficult to obtain reliable data. In the Philippines there is the fear that the patient, by giving information, may cause the compulsory segregation of friends or relatives who are dear to him, a fear which his faith in the efficacy of treatment is not sufficient to overcome. The leper who has become negative has greater faith, yet few have much, for it appears from this rather careful study that the majority attribute their cure to some other influence (religious) or to the natural course of events; in other words, to chance rather than to the efficacy of the treatment. Few, even of the more intelligent, consider that the disease is transmitted from person to person; they incline to the theory that it is due to exposure, particularly to a wetting, or to a bath when overheated or exhausted. The relatively low infection rate naturally makes it difficult to prove the point to them, and they see little to distinguish leprosy in its contagiousness from beri-beri, which is common and which they realize can be avoided in other ways than by keeping from contact with sufferers from the disease. Therefore, they judge that the questioners are "barking up the wrong tree," as we say, and are noncommittal in their answers to questions, correct reply to which might cause trouble to their loved ones.

Many, however, are honest when they state that they have never known a leper, or that they are unable to give satisfactory answers to questions regarding some of their symptoms. They really do not know, either by reason of forgetting occurrences which to them are unimportant or by reason of never having noticed them. Not every patient, even though the questions are put to him in his own dialect, can understand what the investigator is trying to learn.

To enable us to get the greatest possible accuracy in this group, we selected an especially qualified and intelligent man as interpreter for each dialect. One of us (Theodore Bitterman), who did most of the questioning, speaks Spanish and understands enough words of some of the dialects to catch the trend of the answers. The patients were questioned carefully and cross-questioned, particularly in regard to contacts. The results of this method are well illustrated by a man who denied knowing any lepers prior to segregation. The third or fourth patient questioned after him, a much younger man, had the same name and came from the same province and the same barrio. He also denied knowing any leper prior to segregation; but, when these two were called to the questioner's table at the same time they acknowledged they were father and son and that each knew the other had leprosy before the admission of either. Why such a denial should be made is beyond our comprehension, nor could we get from them the reason therefor. One might think that it might be attributed partly to their lack of knowledge of the manifestations of the disease. The careful way in which they are able to describe their symptoms, giving dates (to the date of the month, even when the onset occurred years before), indicates the contrary. We believe that the manifestations of leprosy are extremely well known to all who are able to comprehend and that they themselves make presumptive diagnoses very early in the course of the disease. We believe that the most accurate details of our study are the figures as to date of onset and of the first symptom noticed.

Of course, we have not the experience to warrant a positive statement as to what constitutes the earliest symptom. If the primary recognizable lesion is a break in the surface epithelium of any kind or is an ulceration of the nasal mucosa, these people might easily miss it, as it probably would not be characteristic in the presence of the many confusing skin conditions of the Trop-

ics; but anæsthesia, even of a small area, is quickly noticed by them, as are also the peculiar macules and nodules characteristic of the disease.

TABLE 1.—*Incidence of first lesion, by location on body.*

	Foot and ankle.	Leg.	Thigh, buttock.	Arm and hand.	Neck, face, and ear.
Anæsthesia	114	38	4	33	5
Red spots and cutaneous patches	2	2		4	16
Nodules		1		3	4
White patches		1	2	4	5
Ulcers					1
Total	116	42	6	44	31
Percentage	46.9	16.4	2.4	17.7	12.5

	Body.	Total.	Per cent.	Extremities.	Per cent.
Anæsthesia		194	78.2	185	91.6
Red spots and cutaneous patches	4	28	11.6	8	3.9
Nodules		8	3.2	4	1.9
White patches	5	17	6.8	5	2.7
Ulcers		1			
Total	9	248		202	81.5
Percentage	3.6				

Table 1 shows the location and character of the first lesion. Attention is invited to the preponderance of anæsthesia as the primary symptom, 78.2 per cent; also of the exposed parts of the extremities as the location, 81.5 per cent. Only a few children were included in the series, and in children only was the buttock given as the site of the first lesion noticed. If we add the head, face, and neck, our percentage of exposed parts being first affected becomes 94 per cent, while the addition of the four buttock cases gives us 95.5 per cent. This high percentage can not be without some significance, even in so small a series; and though, as stated before, the work here reported does not warrant conclusions, we have a very strong belief that infection arises, in the majority of cases, through contact of leprous material with solutions of continuity of the skin surface. We also consider it probable that material may find suitable soil for growth in lesions of the mucous membrane. This is of especial importance in the nose, as the contagious material is carried there through the agency of the fingers.

The preponderance of first noticed lesions in the foot and ankle is particularly interesting, nearly half (47 per cent) of such

lesions being in this part and, including the leg, 158, or 63 per cent, in the lower extremity.

The same localization, according to our observations, occurs in yaws in children. Adults acquire the disease from their offspring in a considerable percentage of cases, and in them the lesion is most apt to be on a part of the body in contact with the child, as the arm or waist, according to whether the child is carried on the arm or astride the hip at the waist line.

This localization adds strength to the theory of infection through skin wounds. Such wounds are almost universally present in children and those of the foot and ankle are the most frequent, the incidence diminishing very gradually to the knee, while the hands and arms show a frequency about equal to that of the leg. A considerable proportion of these lesions are skin disease or bites of insects which become infected, itch, and are promptly scratched by fingers and made worse. Any material, present on the hands, capable of infection, is offered an ideal place to grow and multiply.

Such leprosy infections cited in the literature as have been observed to follow contact have been the result of wounds with an instrument contaminated by contact with a leper.

We consider that there is evidence that an intact integument is an excellent protection against the disease although the small rates of infection in consorts indicate the presence of some other type of resistance, either age per se or a gradually acquired immunity.

Table 2 shows that contacts were admitted in only 36.9 per cent of the cases and, with the exception of close relatives, were frequently stated to have been very slight. In the immediate family or among relatives the nephew, niece, son, and daughter were cases of later occurrence than the uncles and the parents, all of whom were also in the hospital and were included in the series. Aside from the immediate family (parents, brothers, and sisters) the contacts with many in the nonrelative group may have been fully as intimate as with members of the family. We will dismiss this table with only a plea for the continuance of the study of lepers from this standpoint, not with the idea that more will be found who will admit contacts than those who will not, but that additional data may be obtained as to the nature of the contact which is most likely to produce infection and as to the age at which such contact is most dangerous.

Table 2 shows figures on contacts with relatives and with nonrelatives as adduced from a study of ninety-nine lepers.

TABLE 2.—*Leper contacts.*

Relatives:		Non-relatives:	
Cousin	10	Acquaintance	19
Sister	9	Friend	12
Brother	6	Neighbor	9
Father	6	Schoolmate	2
Mother	5	Coworker	2
Uncle	2	Companion	2
Nephew	2	Housemate	1
Son	2	Barber	1
Daughter	2	Restaurant keeper	1
Father, brother, and uncles	1		49
Father, brother, and others	1		
Grandmother	1		
Son-in-law	1		
Niece	1		
Brother-in-law	1		
	50		

Total admitting contacts 99, or 36.9 per cent.

The average length of time between the occurrence of the first symptom and segregation is shown in Table 3.

TABLE 3.—*Lapse of time between appearance of first lesion and segregation.*

Segregation.	Cases.	Average duration per case prior to segregation.
		Years.
Voluntary	169	2.76
Not voluntary	90	2.46
Combined	259	3

These results are only approximate, insofar as the data with reference to voluntary segregation are concerned. Patients who report voluntarily are allowed to remain at San Lazaro Hospital, as far as possible, instead of being sent to Culion; as a result those who feared detection or were threatened with exposure by their enemies reported, and others when discovered were allowed to report "voluntarily." The idea that they might remain at San Lazaro, added to the news that a better treatment could be given, was responsible for a decided increase in voluntary submission of early cases in 1922 and 1923.

It is probably true that a leper who has only anæsthetic lesions is not likely to transmit the disease, but our present knowledge

with reference to the infectiousness of leprosy is based almost entirely on observations which lack exactness. Those infected may, in the absence of lesions, excrete the organisms in some way in which bacilli can be found, just as is the case with persons infected with tuberculosis but who show no manifest lesions of the disease. We are, however, not justified by any means in saying that the appearance of any leprous lesions indicates that the case is from then on contagious. Nose ulcers and the cutaneous lesions in which the bacilli are found we consider contagious lesions. Open nasal lesions exist in some lepers who have only anæsthetic areas in addition; so that an undefined number of such cases are undoubtedly as dangerous as any. The figures in our tables, therefore, do not indicate that each leper who formed part of the group actually was capable of transmitting the infection for three years; but they do indicate that he might have been, and we have no means of telling just how many of the group were in such condition. We obtained other data with reference to this possibility of contagion; namely, the length of time each case remained outside the hospital after a positive diagnosis was made or the patient knew he had leprosy and, further, the interval between the first symptom and a skin lesion. From this information we could calculate the average time between the skin lesion and segregation. These data are most inaccurate, in our opinion. Many of the patients appreciated the significance of the question and such persons, particularly those who reported voluntarily, stated the date of diagnosis to have been within a few days of segregation.

Among the 259 cases who furnished data the average time between the first symptom and diagnosis was 2.47 years; between diagnosis and segregation, 0.42; between first symptom and skin lesion, 1.12; between first symptom and segregation, 3; between skin lesion and segregation, 1.88.

These 259 cases, then, were in all probability actually exposing others for 1.88 years, or 1 year 10.5 months, before segregation. Most of these cases are early and not at all representative of the cases of the past. Gradually since 1906, when segregation at Culion was commenced, the lepers who presented themselves and those forcibly isolated, have shown fewer and fewer advanced cases. It is rare now to see advanced cases, which formed a large part of the early groups. In many of the suspects to-day careful microscopical examination is required in order that the diagnosis can be verified.

We have no practicable method of determining how many lepers there are still unsegregated; they probably equal in number those who are segregated, approximately 5,000. If we assume for these the same average length of time between skin lesion and segregation one gets some idea of the exposure rate. This interval is being shortened in increasing proportion as the present methods of handling lepers are continued, and the ratio of decrease will increase more and more rapidly if the present efforts can be maintained. We expect this because of the beneficial results now being achieved and which can be improved if the work, both in other countries and in the Philippines (where the most intensive effort so far put forth in the history of the fight against leprosy is in progress), can be continued and pushed to its greatest development.

The age of appearance of the first symptoms in the 245 cases of this series in which reliable data were obtained confirms the figures published heretofore by many leprologists. The number is too small and the lower-age groups are not sufficiently represented to justify any conclusions from these alone, but this study adds a few statistics that can be combined with future reports. The figures in Table 4 show the incidence of the symptoms first recognized, according to age and sex.

TABLE 4.—*Incidence by age and sex of first recognized symptoms.*

Age group.	Males.		Females.		Total.	
Years.	*Number.*	*Per cent.*	*Number.*	*Per cent.*	*Number.*	*Per cent.*
5 to 9	39	22.1	17	24.6	7	28
10 to 14					49	20 (22.8)
15 to 19	27	15.3	11	15.9	38	15.9
20 to 24	31	17.6	11	15.9	42	17.1
25 to 29	23	13	6	8.7	29	11.4
30 to 34	27	15.3	9	13	21 (36)	8.6
35 to 39					15	6.1
40 to 44	19	10.7	10	14.5	18	7.3
45 to 49					11	4.4
50 to 59	4	2.2	4	5.8	8	3.2
60 to 80	6	3.4	1	1.4	7	2.8
Total	176	71.8	69	28.2	245	

The difference between the rate for males and that for females is not sufficient to be suggestive. The graph (fig. 1) indicates the trend of the data in Table 4. More figures are needed to make the results of sufficient value to warrant conclusions.

We feel that further discussion of the data obtained in this study is not warranted. Many very interesting stories were obtained in taking the histories of these patients, including a few weird tales of exciting causes in which the patients thoroughly believe.

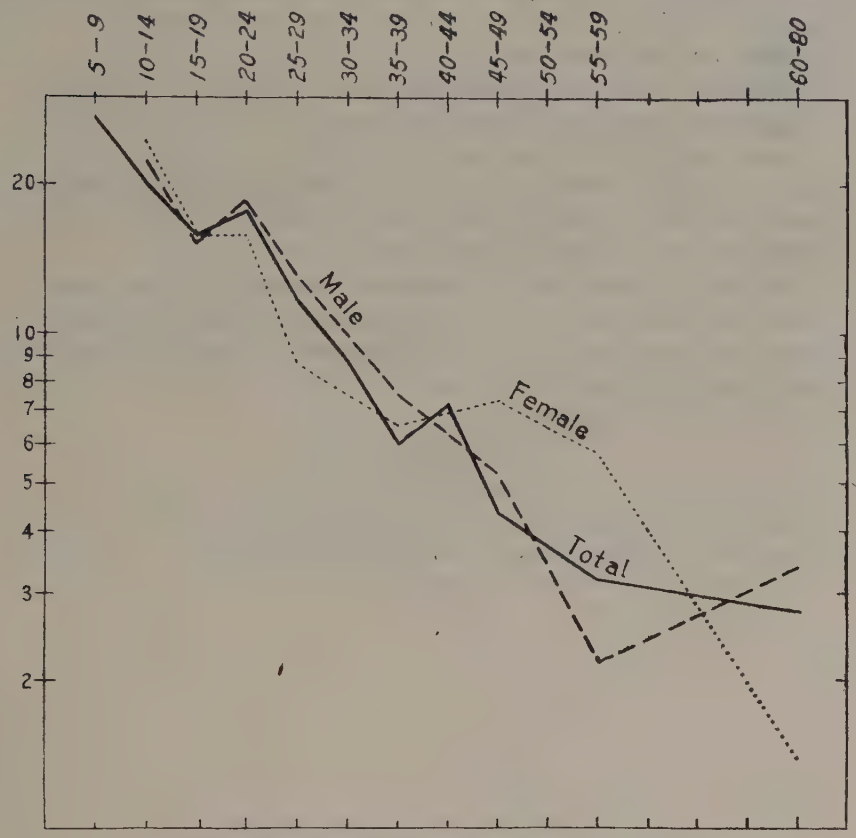


FIG. 1. Incidence by age and sex of first recognized symptoms.

Many were treated for some time before being segregated. One or two might still be continuing treatment from private physicians except that their means became exhausted. If the skin lesions do not involve the face, or until such appear, the leper stands little risk of being apprehended. If we could afford to make the present methods of treatment available to all and the victims could be persuaded of the necessity for keeping apart from the noninfected, more especially from children, the problem would soon be solved.

SUMMARY

A brief study of some of the epidemiological aspects of the histories of 259 lepers is presented in an effort to stimulate the continuance of this method of research in leprosy in the Philippine Islands. The material is here and under control, and a Filipino should be able to get more reliable data than was possible for two Americans.

Additional evidence is presented in this study that the earliest recognizable lesion is an anæsthetic area.

These data on the location of the primary lesion add to the data reported by others and favor the theory that the organism enters the body through abrasions or similar wounds in the integument of the exposed parts of the body.

The age at which the first symptom appeared in the cases of this series also agrees with the findings of others, that the more susceptible ages are in the first decades, although no age appears exempt, unless we extend the possible incubation period beyond reasonable limits.

REFERENCES

MUIR, E. Some notes on the transmission of leprosy. Ind. Med. Gaz. No. 12 (December, 1923) 572.

GOMEZ, LIBORIO. The question of the initial lesion of leprosy. Journ. Phil. Is. Med. Assoc. No. 5 3 (September, 1923) 227.

ILLUSTRATION

TEXT FIGURE

FIG. 1. Incidence by age and sex of first recognized symptoms of leprosy. 19

NEW SPECIES OF PHILIPPINE PLANTS COLLECTED BY A. LOHER

By Elmer D. Merrill

Of the University of California, Berkeley

In June, 1923, Mr. A. Loher, a long-time resident of Manila, presented to the Bureau of Science his entire collection of botanical material prepared by him between the years 1908 and 1915. The collection contains over 3,000 numbers (Nos. 12,000 to 15,170), and in it there are represented approximately 1,500 species of ferns and flowering plants. With the exception of a few numbers from the vicinity of Lake Mainit, Surigao Province, Mindanao, and from Polillo Island, and a somewhat larger number from the Caraballo Mountains in Nueva Vizcaya Province, Luzon, the bulk of the collection comes from the mountainous region northeast of Manila, mostly from Rizal Province, but with an interesting series of species from the Umirey River region on the Pacific coast in Tayabas Province, Luzon. The localities are Montalban, Balacbac, Balintingan, Angilo, Mabiluang, Bantol, Puray, Guinuisan, Pinauisan, Sumag, Paningtingan, Siya Bundoc, and Lucutan—all in Rizal Province—and the Umirey region in Tayabas Province contiguous to the eastern boundary of Rizal Province.

Those parts of Rizal and Tayabas Provinces are exceedingly rough, characterized by numerous rugged mountains which attain altitudes of from 900 to 1,800 meters, the peaks and ranges being separated by deep gorges. Field work there is exceedingly difficult on account of the rough nature of the country, the difficult trails, and the sparse, primitive population. Many places are entirely inaccessible in the rainy season because of the fact that the few existing trails frequently follow the stream beds, and thus become impassable in times of flood or high water. A large part of the Loher collection came from the more inaccessible parts of this region; access to these distant parts of Rizal Province, and to the Umirey region in Tayabas Province is only on foot, over difficult trails, and involves toilsome journeys of sev-

eral days from Manila. Just how difficult field work in botany is in such regions can be appreciated only by those who have accomplished it.

Although in relatively close proximity to Manila, the various mountains being readily visible from the city, the region has never been thoroughly explored, although collectors of the Bureau of Science, notably Ramos, Reillo, and Edaño, have made extensive botanical collections there during the past fifteen years. Those collections yielded very numerous previously undescribed forms, the descriptions of which have been published from time to time. The Loher collection naturally contains numerous representatives of these species; but it also contains a considerable number of forms not hitherto represented by any collections that have been available to me for study. The present paper consists almost entirely of descriptions of new species based wholly on the Loher collection; a total of 41 is here proposed.

Shortly after the collection was presented to the Bureau of Science it became necessary for me to leave Manila on an official trip to Australia. I planned to study the material immediately after my return to Manila early in October, 1923, but unexpectedly left for the United States on November 4, and it was thus impossible for me to do more than make a preliminary examination of the material. At my request the entire collection was shipped to me at Berkeley, and the identifications have been completed here. The task has been a rather difficult one, because of the fact that I have not had access to the type material and to the very extensive general collections in the herbarium of the Bureau of Science for purposes of comparison, but have had to a large degree to depend on my memory of the characters of previously described species supplemented by the published descriptions.

Types of all species described are deposited in the herbarium of the Bureau of Science, and a representative of each new species has been deposited in the herbarium of the University of California. Duplicates of the general collection, so far as these have been available, have been distributed to other botanical institutions; by far the largest set, at Mr. Loher's request, was sent to the herbarium of the University of Munich. In general, however, duplicate material is limited, rarely exceeding four or five specimens under each number, many numbers being represented by only one or two duplicates.

URTICACEÆ

Genus **PILEA** Lindley

Pilea loheri sp. nov.

Herba glabra, erecta, parce ramosa, circiter 20 cm alta; foliis in paribus valde inaequalibus, membranaceis, ovatis ad oblongo-ovatis, olivaceis, utrinque cystolithis numerosis perspicuis instructis, acutis vel acuminatis, basi 3-plinerviis, margine incurvato-serratis, majoribus 2 ad 3 cm longis, basi acutis, minoribus 1 cm longis, basi late rotundatis vel subcordatis; inflorescentiis axillaribus, tenuibus, quam petiolo multo longioribus, cymulis plerumque 2, 4 ad 6 mm diametro, floribus confertis; sepalis ♀ 3, valde inaequalibus, majoribus concavis, 1.5 mm longis; acheniis ellipsoideis, compressis, laevis, 1.5 mm longis.

An erect, sparingly branched, glabrous herb about 20 cm high, the stems 2 mm in diameter, the branches slender. Leaves in unequal pairs, olivaceous, paler beneath, dull, membranaceous, ovate to oblong-ovate, with numerous, conspicuous, irregularly disposed cystoliths on both surfaces, acute or somewhat acuminate, 3-plinerved, the margins with conspicuous incurved serrations, the larger ones of each pair 2 to 3 cm long, 1.5 cm wide, base acute, the smaller ones about 1 cm long, their bases broadly rounded or subcordate, the petioles of the larger leaves 1 cm, of the smaller ones 2 mm in length. Inflorescences axillary, slender, 1.5 to 2.5 cm long, each bearing usually two densely flowered cymules 4 to 6 mm in diameter. Pistillate flowers with three very unequal calyx segments, the largest one concave, 1.5 mm long, the two smaller ones less then 1 mm long. Achenes elliptic, compressed, rounded, smooth, about 1.5 mm long.

LUZON, Rizal Province, Balintingan, *Loher 12797*, July, 1909.

Among the Philippine species a strongly marked form falling in the general group with *Pilea benguetensis* C. B. Rob., but not at all closely allied to it.

LAURACEÆ

Genus **CINNAMOMUM** Tournefort

Cinnamomum loheri sp. nov.

Arbor glabra (floribus ignotis), ramulis rubro-brunneis, circiter 3 mm diametro; foliis crasse coriaceis, oblongo-ovatis ad oblongo-ellipticis, 7 ad 10 cm longis, 3 ad 4 cm latis, in siccitate pallide brunneis, nitidis, subtus subglaucescentibus, apice dis-

tincte acuminatis, basi acutis, perspicue 3-plinerviis, reticulis obscuris; infructescentiis glabris, depauperato-paniculatis, foliis subaequantibus; fructibus globosis, 1.5 cm diametro, calycis persistentibus crassis, subdisciformibus, truncatis, 1 cm diametro.

A glabrous tree (flowers unknown), the branches reddish brown, subterete, the ultimate ones about 3 mm in diameter. Leaves thickly coriaceous, oblong-ovate to oblong-elliptic, 7 to 10 cm long, 3 to 4 cm wide, pale brownish and shining on the smooth upper surface when dry, the lower surface subglaucous, the apex distinctly acuminate, base acute, very prominently 3-plinerved, the reticulations obscure; petiole 10 to 12 mm long. Infructescences glabrous, about as long as the leaves, each bearing a few globose fruits about 1.5 cm in diameter, the persistent calyces disklike or somewhat saucer-shaped, thickly coriaceous, truncate, 1 cm in diameter.

LUZON, Rizal Province, Mabiluang, *Loher 14469*, October, 1913.

A species in vegetative characters resembling *Cinnamomum mercadoi* Vid., but with radically different fruits, the rather large globose fruits being seated on, not at all inclosed by, the conspicuous, thickened, truncate, disklike or very shallowly saucer-shaped, accrescent calyces.

Genus **CRYPTOCARYA** R. Brown

Cryptocarya loheri sp. nov.

Arbor, ramulis inflorescentiisque perspicue ferrugineo-pubescentibus; foliis glabris vel subtus ad costa nervisque plus minusve ferrugineo-pubescentibus, chartaceis, acuminatis, basi acutis, oblongis ad oblongo-ellipticis, 9 ad 15 cm longis, 3 ad 6 cm latis, in siccitate supra olivaceis vel pallidis, subtus brunneis, nervis utrinque 8 vel 9, valde perspicuis, curvato-subadscendentibus, subminute subfoveolato-reticulatis; paniculis circiter 15 cm longis, multifloris, floribus 3.5 mm longis, pubescentibus, lobis ellipticis, 2 mm longis; filamentis leviter pubescentibus, ovario glabro.

A tree, the branchlets and inflorescences conspicuously ferruginous-pubescent. Leaves chartaceous, oblong to oblong-elliptic, 9 to 15 cm long, 3 to 6 cm wide, when dry pale olivaceous on the glabrous upper surface, the lower surface brown, not at all glaucous, the midrib and lateral nerves more or less ferruginous-pubescent, becoming glabrous or nearly so, the base acute, apex prominently acuminate; lateral nerves 8 or 9 on each side of the midrib, prominent, curved-subascending, scarcely anastomosing,

the ultimate reticulations forming shallow but small and rather close foveolæ; petioles 7 to 10 mm long, usually pubescent. Panicles terminal and in the upper axils, up to 15 cm long, many-flowered, ferruginous-pubescent. Flowers 3.5 mm long, pubescent, the perianth lobes elliptic, 2 mm long. Filaments slightly pubescent. Ovary and style glabrous.

LUZON, Rizal Province, Montalban, *Loher 12349* (type), *12350*, October, 1909.

Probably as closely allied to *Cryptocarya oblongata* Merr. as any hitherto described species, differing especially in its fewer-nerved leaves.

LEGUMINOSÆ

Genus **BAUHINIA** Linnæus

Bauhinia pachyphylla sp. nov. § *Phanera.*

Frutex scandens, inflorescentiis densissime castaneo-pubescentibus exceptis glaber; foliis suborbicularis, crasse coriaceis, circiter 10 cm longis, usque ad $\frac{1}{3}$ divisis, lobis obtusis, basi late rotundatis, distincte cordatis, perspicue 11-nerviis; inflorescentiis terminalibus, stricte racemosis, densissime castaneo-pubescentibus, 20 ad 30 cm longis; floribus pedicellatis, circiter 4.5 cm longis, calcyis tubo 2 cm longo, basi cuneato, lobis oblongis, circiter 1.6 cm longis; petalis unguiculatis, 2.5 cm longis, extus pubescentibus, lamina elliptica, 1.5 cm longa; staminibus fertilibus 3, filamentis glabris, 1.5 cm longis, antheris oblongis, 7 mm longis; ovario dense pubescente.

A scandent shrub, glabrous except the very densely castaneous-pubescent inflorescences, the ultimate branches brown, terete, about 5 mm in diameter. Leaves suborbicular, 2-lobed, thickly coriaceous, brown when dry, about 10 cm in diameter, divided about one-third to the base, the lobes ovate, obtuse, the base broadly rounded, distinctly cordate, 11-nerved, the nerves very prominent, reticulations distinct; petioles stout, about 1.5 cm long. Inflorescences terminal, strictly racemose, 20 to 30 cm long, very densely pubescent with castaneous hair, marked with the conspicuous scars of fallen pedicels, flowering only near the top. Flowers pale yellow (castaneous when dry), about 4.5 cm long, their pedicels stout, up to 2 cm long, the buds obtuse. Calyx tube cylindric, narrowed below to the cuneate base, about 2 cm long, the lobes oblong, acute, about 1.6 cm long, 4.5 mm wide, densely pubescent externally. Petals clawed, about 2.5 cm long, pubescent externally, the limb elliptic, rounded, base acute, about 1.5 cm long, 1.2 mm wide. Fertile stamens 3, their fila-

ments glabrous, 1.5 cm long, the anthers oblong, 7 mm in length. Ovary stipitate, oblong, densely pubescent; style short. Pods oblong, thin, flat, somewhat ferruginous-pubescent, becoming nearly glabrous, smooth, about 13 cm long, 3.5 cm wide. Seeds suborbicular to ellipsoid, compressed, flat, nearly black, shining, 1.5 to 1.8 cm long.

LUZON, Rizal Province, Balintingan, *Loher 12978*, April, 1915, altitude about 1,400 meters.

A strongly marked species, not closely allied to any of the hitherto described Philippine forms, well characterized by its thickly coriaceous leaves and its stout, densely castaneous-pubescent racemes and flowers.

RUTACEÆ

Genus **MICROMELUM** Blume

Micromelum caudatum sp. nov.

Arbor parva, partibus junioribus inflorescentiisque exceptis glabra; foliis 20 ad 30 cm longis, foliolis circiter 7, chartaceis, glabris, oblongo-ovatis ad oblongo-lanceolatis, inaequilateralibus, integris, caudato-acuminatis, 6 ad 11 cm longis, 2.5 ad 4 cm latis, nervis utrinque 5 ad 7, distinctis, subtus in axillis perspicue glandulosis; inflorescentiis cymosis, 5 ad 8 cm diametro, dense breviter cinereo-pubescentibus; floribus numerosis, petalis oblongis, 4 mm longis, extus dense pubescentibus; filamentis longioribus 4 mm, brevioribus 3 mm longis; ovario cylindrico, parce hirsuto, stylis cylindricis, circiter 1 mm longis.

A small tree, glabrous except for the slightly pubescent younger parts and the rather densely pubescent inflorescences, the branches and branchlets pale, terete. Leaves 20 to 30 cm long, the leaflets about 7, chartaceous, glabrous, usually pale olivaceous, oblong-ovate to oblong-lanceolate, caudate-acuminate, the base inequilateral, acute on both sides or rounded on the broader side; lateral nerves 5 to 7 on each side of the midrib, prominent, with a large depressed gland (domatia) in each axil on the lower surface, glandular-punctate, the reticulations obsolete. Cymes terminal, 5 to 8 cm in diameter, densely cinereous-pubescent with short hairs, many-flowered. Calyx pubescent, somewhat cup-shaped, about 2 mm in diameter, obscurely toothed. Petals oblong, pubescent externally, 4 mm long. Longer filaments 4 mm, shorter ones 3 mm in length. Ovary cylin-

dric, sparingly hirsute; styles cylindric, glabrous, about 1 mm long.

LUZON, Rizal and Tayabas Provinces, Montalban and Umirey, *Loher 12822, 12859, 13615* (type), *14409*, flowering in March, April, and May.

A species most closely allied to *Micromelum curranii* Elm., but with smaller cymes, smooth, not verruculose leaves which have prominent depressed glands in the axils on the lower surface, and somewhat hirsute, not glabrous ovaries.

Genus **CLAUSENA** Burman f.

Clausena loheri sp. nov.

Arbor parva, inflorescentiis parce puberulis exceptis glabra; foliis circiter 50 cm longis, foliolis circiter 7, chartaceis, oblongis, integris, in siccitate pallidis, acuminatis, basi plerumque inaequilateralibus, perspicue glandulosis, 12 ad 17 cm longis, 4 ad 6 cm latis, nervis utrinque circiter 9, perspicuis; paniculis terminalibus, usque ad 25 cm longis, floribus numerosis, 5-meris, calycis 2 mm diametro, lobis brevibus, acutis; petalis oblongo-ellipticis, obtusis, 4 mm longis, glabris; antheris 1.5 mm longis, obtusis; ovario glabro, ovoideo, rugoso, stylis cylindraceis, vix 1 mm longis.

A small tree, entirely glabrous except the obscurely cinereous-puberulent panicles, all parts, branches, leaves, and flowers conspicuously glandular, the branches pale when dry. Leaves about 50 cm long, the leaflets about 7, chartaceous, pale when dry, entirely glabrous, entire, oblong, 12 to 17 cm long, 4 to 6 cm wide, shortly acuminate, base usually inequilateral, rounded on one side, acute on the other; lateral nerves about 9 on each side of the midrib, prominent, anastomosing, the reticulations distinct. Panicles narrowly pyramidal, terminal, up to 25 cm long, the flowers numerous, white, 5-merous. Calyx about 2 mm in diameter, the lobes short, acute, obscurely ciliate, glandular. Petals oblong-elliptic, obtuse, glandular, 4 mm long. Anthers 1.5 mm long, obtuse. Ovary ovoid, glabrous, glandular, rugose, the style cylindric, less than 1 mm long.

LUZON, Rizal Province, Montalban, *Loher 12110* (type), *13286, 14357*, flowering in April and May.

This may ultimately prove to be but a large-leaved form of *Clausena anisum-olens* (Blanco) Merr., from which it differs in its entire, larger leaflets and in various other characters.

MELIACEÆ

Genus **DYSOXYLUM** Blume

Dysoxylum loheri sp. nov. § *Eudysoxylum.*

Arbor parva, foliis 45 ad 90 cm longis, foliolis 15 ad 21, oblongis, oppositis, sessilibus, 11 ad 16 cm longis, 4 ad 5 cm latis, subtus molliter pubescentibus, acutis ad breviter acuminatis, basi rotundatis, plerumque inaequilateralibus, chartaceis ad subcoriaceis, nervis utrinque circiter 20; floribus caulinis, e tuberculis magnis, fasciculatis, vel in racemis paucifloris fasciculatis, vel in ramis subsolitariis, 4-meris, circiter 17 mm longis; calycis membranaceis, inflatis, cylindraceis, dense maculatis, extus leviter ciliatis, 3-lobatis, lobis late ovatis, 3 ad 4 mm longis; petalis 4, liberis, extus pubescentibus, ligulatis, 16 mm longis; tubo 15 mm longo, cylindrico, glabro, apice 8-lobato, lobis oblongis, 2 mm longis; antheris 8, oblongis, 1.5 mm longis; ovario dense villoso, stylis in partibus inferioribus dense villosis, sursum glabris.

A small tree, the leaves 45 to 90 cm long, the rachis up to 5 mm in diameter, densely pubescent; leaflets 15 to 21, sessile, opposite, oblong, chartaceous to subcoriaceous, 11 to 16 cm long, 4 to 5 cm wide, acute to shortly acuminate, base rounded, mostly inequilateral, the upper surface olivaceous, glabrous or nearly so, the lower surface softly and rather densely pubescent; lateral nerves about 20 on each side of the midrib, rather prominent, spreading, the reticulations obsolete. Flowers white, borne on the trunk and larger branches, those on the trunk from large tubercles, here often racemose, those on the branches solitary or subsolitary, the pedicels up to 10 mm long, slightly ciliate, the racemes when present short, with but 2 or 3 flowers. Calyx inflated, membranaceous, cylindric, 9 mm long, slightly ciliate, with very numerous small brownish maculæ, 3-lobed, the lobes broadly ovate, acute or obtuse, 3 to 4 mm long. Petals 4, free, ligulate, 16 mm long, 2.8 mm wide, pubescent on the back in the upper half. Staminal tube cylindric, 15 mm long, about 3 mm in diameter, glabrous, the apex 8-lobed, the lobes oblong, 2 mm long, truncate or slightly retuse. Anthers 8, oblong, 1.5 mm long, inserted between the lobes of the tube. Disk cylindric, glabrous, 4 mm long, somewhat narrowed upward, crenulate. Ovary and lower half of the style very densely fulvous-villous, the upper half of the style glabrous.

LUZON, Rizal Province, Angilo, *Loher 14181*, March, 1914.

A species closely allied to *Dysoxylum robinsonii* Merr., differing especially in its larger leaves and more numerously nerved leaflets which are softly pubescent on the lower surface.

POLYGALACEÆ

Genus **XANTHOPHYLLUM** Roxburgh

Xanthophyllum loheri sp. nov.

Arbor, inflorescentiis exceptis glabra, ramis ramulisque tenuibus, teretibus, brunneis vel olivaceo-brunneis; foliis flavidis, oblongo-ovatis ad oblongo-ellipticis, subcoriaceis, 6 ad 7 cm longis, usque ad 3 cm latis, utrinque subaequaliter angustatis, basi acutis, apice breviter obtuseque acuminatis, nervis utrinque 5 vel 6, distinctis, subtus in axillis haud glandulosis; paniculis terminalibus et in axillis superioribus, multifloris, cinereo-pubescentibus, foliis aequantibus; floribus parvis (ca. 6 mm longis) sepalis pubescentibus, inaequalibus, 2 ad 3 mm longis, obtusis; petalis 6 mm longis, angustioribus glabris, inferioribus extus ciliatis; ovario deorsum glabro, sursum pubescente; ovulis 8; stylis dense ciliatis.

A tree, glabrous except the cinereous-pubescent inflorescences, the branches and branchlets slender, terete, smooth. Leaves subcoriaceous, yellowish, oblong-ovate to oblong-elliptic, 6 to 7 cm long, 2.5 to 3 cm wide, subequally narrowed to the acute base and to the obtusely acuminate apex; lateral nerves 5 or 6 on each side of the midrib, distinct, the reticulations evident, rather close, the axils beneath eglandular; petioles 3 to 4 mm long. Panicles axillary and terminal, many-flowered, the individual ones equal to or shorter than the leaves, forming an ample leafy inflorescence. Pedicels pubescent, 3 mm long. Bracts oblong-ovate, 1.5 mm long. Flowers pale yellow, 6 mm long. Sepals unequal, ovate to elliptic, obtuse, pubescent, 2 to 3 mm long. Petals 6 mm long, the narrow ones glabrous, except their slightly pubescent lower margins, the lower broader one somewhat ciliate-pubescent on the back. Disk cup-shaped, fleshy, glabrous. Filaments somewhat ciliate. Ovary stipitate, glabrous below, pubescent above, 8-ovulate; style stout, curved, densely pubescent.

LUZON, Rizal Province, Balacbac, *Loher 14978*, June, 1912.

A species resembling and allied to *Xanthophyllum excelsum* (Blume) Miq. (*X. glandulosum* Merr.) but with smaller flowers and leaves, the vein axils eglandular beneath. It may possibly prove to be the same as *Xanthophyllum multiramosum* Elm.

which, rightly or wrongly, I have reduced to *X. excelsum* Miq., but which is known only from fruiting specimens.

EUPHORBIACEÆ

Genus **GELONIUM** Roxburgh

Gelonium stenophyllum sp. nov.

Frutex glaber (floribus exceptis), ramis ramulisque tenuibus, teretibus, vel ramulis ultimis obscure angulatis; foliis lanceolatis, 5 ad 11 cm longis, 1 ad 2 cm latis, chartaceis vel subcoriaceis, in siccitate pallidis, nitidis, margine plerumque recurvatis, utrinque angustatis, basi acutis, apice tenuiter acuminatis, rariter subacutis, nervis primariis utrinque circiter 12, distinctis, arcuato-anastomosantibus, reticulis laxis, distinctis; floribus sessilibus, axillaribus, solitariis vel depauperato-fasciculatis, sepalis leviter pubescentibus, obovatis ad ellipticis, 2.5 mm longis; staminibus circiter 17, filamentis 2 mm longis; fructibus subglobosis, circiter 1 cm diametro, seminibus 2 vel 3.

A glabrous shrub, the branches and branchlets slender, terete, or the ultimate branchlets obscurely angled, pale. Leaves lanceolate, 5 to 11 cm long, 1 to 2 cm wide, chartaceous to subcoriaceous, pale and shining on both surfaces when dry, margins usually recurved, narrowed to the acute base and to the slenderly acuminate, rarely subacute apex; lateral nerves about 12 on each side of the midrib, slender, distinct, arched-anastomosing, the reticulations lax, distinct; petioles 2 to 4 mm long. Staminate flowers axillary, solitary or depauperate-fasciculate, sessile, white, the sepals sparingly pubescent, obovate to elliptic, about 2.5 mm long. Stamens about 17, their filaments 2 mm long. Fruit subglobose, shortly pedicelled, red, about 1 cm in diameter, 2- or 3-celled.

LUZON, Rizal Province, Montalban and Paningtingan, *Loher 12639, 12929, 13345* (type), *15067*, flowering in March and May, fruiting in October.

A species belonging in the group with *Gelonium philippinense* Pax and K. Hoffm., distinguished especially by its much narrower, very differently shaped, smaller, lanceolate, acuminate leaves and its much smaller fruits.

Genus **DIMORPHOCALYX** Thwaites

Dimorphocalyx loheri sp. nov.

Frutex vel arbor parva, subglabra, monoica; foliis confertis, chartaceis ad subcoriaceis, breviter petiolatis, oblongis ad

oblongo-oblanceolatis, 5 ad 11 cm longis, obtusis ad obtuse acuminatis, basi cuneatis, margine distanter obscure serrulatis, nervis utrinque 8 ad 12, perspicuis; floribus ♂ fasciculatis, paucis, breviter pedicellatis, petalis elliptico-ovatis, 2 mm longis, staminibus 13; ♀ solitariis, pedicellatis, pedicellis ad 1.5 cm longis sursum incrassatis, sepalis oblongis, 4 mm longis, petalis ellipticis, rotundatis, circiter 5 mm longis, ovario dense pubescente.

A monœcious shrub or small tree, nearly glabrous. Branches brown, terete, glabrous, the tips of the branchlets slightly pubescent. Leaves crowded on the branchlets, chartaceous to subcoriaceous, oblong to oblong-oblanceolate, glabrous, or when young sparingly appressed-pubescent, 5 to 11 cm long, 2 to 3 cm wide, the upper surface dark olivaceous, the lower surface pale when dry, apex obtuse to shortly and obtusely acuminate, base cuneate, margins distantly and obscurely serrulate or apiculate-serrulate; lateral nerves 8 to 12 on each side of the midrib, prominent on the lower surface, arched-anastomosing, reticulations few, very lax; petioles 3 to 5 mm long. Staminate flowers few, axillary, fascicled, their pedicels in anthesis up to 3 mm long, somewhat pubescent. Sepals ovate, obtuse, slightly pubescent, 1 mm long. Petals glabrous, elliptic-ovate, rounded, 2 mm long. Stamens 13, nearly free, glabrous, about 1 mm long. Pistillate flowers solitary, few, on the same branches as the staminate ones, their pedicels thickened upward, pubescent up to 1.5 cm long. Sepals oblong, 4 mm long. Petals elliptic, rounded, 5 mm long, 3.5 mm wide. Ovary densely pubescent; styles cleft nearly to the base, about 2 mm long.

LUZON, Rizal Province, Montalban, *Loher 12467* (type), *14847*, June, 1909, and December, 1913.

A species allied to *Dimorphocalyx denticulatus* Merr. but the leaves not slenderly acuminate, the staminate flowers fascicled, and the ovaries densely pubescent.

AQUIFOLIACEÆ

Genus ILEX Linnæus

Ilex loheri sp. nov.

Species *I. buergeri* Miq. affinis, differt foliis majoribus, usque ad 13 cm longis et 6 cm latis.

A tree, entirely glabrous except the somewhat puberulent inflorescences, the branches and branchlets pale, rugose, the latter irregularly angled, about 3 mm in diameter. Leaves coriaceous, oblong to oblong-elliptic, 9 to 13 cm long, 3 to 6 cm wide, the

upper surface pale olivaceous, slightly shining, the lower surface paler than the upper, subequally narrowed to the acute base and to the blunt-acuminate apex, the acumen 1 to 1.5 cm long, the margins distantly and rather obscurely undulate-crenate, each crenulation with a distinct black gland; lateral nerves about 10 on each side of the midrib, slender, distinct, arched-anastomosing, the reticulations very lax, slender, not prominent; petioles 1 to 1.7 cm long. Flowers axillary, 4-merous, about 8 mm in diameter, fascicled, or in 2- or 3-flowered racemes borne on a common rachis up to 5 mm long, the inflorescences puberulent, the pedicels slender, 5 to 6 mm long, the bracts oblong-ovate, acuminate, 1 to 2 mm long, the bracteoles similar but smaller. Calyx lobes ovate, obtuse to rounded, about 1 mm long, obscurely puberulent, becoming glabrous. Petals oblong-elliptic, rounded, 4 mm long, 2 to 2.2 mm wide. Filaments thickened below, 4 mm long; anthers ovoid, 1 mm long.

LUZON, Rizal Province, Bantol, *Loher 14144* (type), *14255*, February and March.

Additional material may show that this is scarcely other than a large-leaved variety of *Ilex buergeri* Miq. It differs from the Benguet material representing the variety *rolfei* of Miquel's species in numerous details.

CELASTRACEÆ

Genus **KOKOONIA** Thwaites

Kokoonia luzoniensis sp. nov.

Arbor glabra; foliis oppositis, coriaceis, integris, ellipticis ad oblongo-ellipticis, basi acutis, apice rotundatis ad breviter obtuse acuminatis, in siccitate pallidis, 6 ad 8 cm longis, nervis utrinque 4 vel 5, adscendentibus; inflorescentiis axillaribus, pedunculatis, laxis, paniculatis, foliis aequantibus vel longioribus; floribus 3.5 mm longis, sepalis 5, ovatis, obtusis ad acutis, circiter 1 mm longis, obscure laciniato-ciliatis; petalis 5, oblongo-spatulatis, obtusis, basi cuneatis; antheris 3, sessilibus, 0.4 mm longis; ovario 3-loculare, loculis 6-ovulatis, ovulis axillaribus, biseriatis, adscendentibus.

A glabrous tree, the branches and branchlets terete. Leaves opposite, coriaceous, pale when dry, elliptic to oblong-elliptic, entire, 6 to 8 cm long, 2.5 to 5 cm wide, base acute, apex rounded to shortly and obtusely acuminate; lateral nerves 4 or 5 on each side of the midrib, ascending, not prominent, the reticulations lax, obscure; petioles 5 to 8 mm long. Inflorescences paniculate,

axillary, peduncled, rather slender, many-flowered, equaling or somewhat exceeding the leaves. Flowers yellowish, about 3.5 mm long, pedicelled. Sepals 5, ovate, about 1 mm long, obtuse to acute, their margins obscurely laciniate-ciliate. Petals 5, oblong-spatulate to oblanceolate, rounded, base cuneate, glabrous, about 3.5 mm long, 1 mm wide. Disk fleshy, inclosing the ovary, the 3 stamens inserted on the inner margin of the disk, the anthers sessile or subsessile, subglobose, 0.4 mm long. Ovary 3-celled, ovules 6 in each cell, axile, ascending, arranged in two rows. Style very short. Fruit unknown.

LUZON, Oriud, *Loher 13391*, May, 1915. The same species is apparently represented by *Loher 12754*, from Montalban, the specimen with immature flowers.

This species is anomalous in *Kokoonia* through its 3 sessile, minute, subglobose anthers, in its ovary cells being 6-ovulate instead of 4-ovulate, and in its somewhat ciliate-laciniate sepals, but conforms better with the characters of *Kokoonia* than with those of any other described genus. Fruiting material may show that some other generic disposition of it is indicated.

Genus **SIPHONODON** Griffith

Siphonodon pyriformis Merr. var. **parvifolius** var. nov.

A typo differt foliis minoribus, 4 ad 5 cm longis.

LUZON, Rizal Province, Balacbac, Montalban, *Loher 12809*, March, 1909, altitude about 800 meters.

The specimen is in fruit, and the fruit presents the characteristics of the species.

STAPHYLEACEÆ

Genus **TURPINIA** Ventenant

Turpinia pachyphylla sp. nov.

Arbor glabra, ramulis teretibus, circiter 8 mm diametro; foliis plerumque 5-foliolatis, circiter 25 cm longis, foliolis ellipticis, crasse coriaceis, acuminatis, minute glanduloso-crenulatis, 12 ad 15 cm longis, nervis utrinque circiter 6, curvato-adscendentibus, perspicuis; inflorescentiis axillaribus, pedunculatis, usque ad 25 cm longis, multifloris; floribus 4.5 mm longis, sepalis petalisque ad margine obscure ciliatis, sepalis elliptico-ovatis, rotundatis, 4 mm longis, petalis oblongo-ellipticis, rotundatis, quam sepalis paullo angustioribus; filamentis crassis, glabris, 2.5 mm longis; stylis connatis; ovario 3-loculare, ovulis 6, biseriatis.

A glabrous tree, the branchlets terete, smooth, brown when dry, about 8 mm in diameter. Leaves mostly 5-foliolate, about 25 cm long, the leaflets elliptic, thickly coriaceous, distinctly acuminate, base broadly acute to rounded, margins rather obscurely glandular-crenulate, the upper surface brownish olivaceous, the lower somewhat pale, slightly shining; lateral nerves about 6 on each side of the midrib, prominent, curved-ascending, the reticulations distinct; petiolules stout, 10 to 14 mm long. Inflorescences axillary, peduncled, equaling the leaves, stout, many-flowered, the nodes supplied with greatly reduced simple leaves. Flowers about 4.5 mm long, the sepals coriaceous, elliptic-ovate, rounded, 4 mm long, margins obscurely ciliate. Petals equaling the sepals, somewhat thinner, slightly narrower, margins slightly ciliate, apex rounded. Filaments stout, glabrous, 2.5 mm long. Styles entirely united, stout. Ovary 3-celled, each cell with 6 ovules, the ovules 2-seriate.

LUZON, Rizal Province, Mabiluang, *Loher 14463*, October, 1913.

With a very broad interpretation of *Turpinia pomifera* DC., this form would be included in that species. The characters, however, would seem to indicate that it should be distinguished from that collective species. The stout branchlets, thick leaflets, many-flowered inflorescences, and distinctly large flowers are characteristic.

Turpinia simplicifolia sp. nov.

Arbor glabra, ramis ramulisque teretibus, tenuibus; foliis stricte 1-foliolatis, chartaceis, oblongis ad oblongo-ellipticis, 10 ad 15 cm longis, tenuiter acuminatis, basi acutis, integris, nervis utrinque circiter 12, tenuibus, distinctis; inflorescentiis tenuibus, laxis, pedunculatis, paniculatis, foliis aequantibus vel longioribus; floribus circiter 3 mm longis, sepalis glabris, petalis ad margine obscure ciliatis, rotundatis; ovario 3-loculare, loculis biovulatis.

A glabrous tree, the branches and branchlets slender, terete, reddish brown, the ultimate branchlets about 1.5 mm in diameter. Leaves simple, chartaceous, pale and somewhat shining when dry, oblong to oblong-elliptic, 10 to 15 cm long, 3.5 to 5.5 cm wide, entire, narrowed below to the acute base and above to the slenderly acuminate apex; lateral nerves about 12 on each side of the midrib, slender, distinct, anastomosing, the

reticulations rather close, evident on both surfaces; petioles slender, 1.5 to 2.5 cm long. Inflorescences axillary, peduncled, slender, lax, equaling or somewhat exceeding the leaves. Flowers about 3 mm long, the sepals elliptic, rounded, about 2.5 mm long, glabrous, the petals similar to the sepals but somewhat thinner and slightly ciliate on their margins. Filaments 2 mm long. Ovary glabrous, 3-celled, cells 2-ovuled, the styles entirely united, up to 3 mm long.

LUZON, Rizal Province, Montalban and Balacbac, *Loher 12756, 12772, 12992* (type).

A very distinct species not at all closely allied to any previously described form, strongly characterized by its strictly simple, slenderly acuminate, many-nerved leaves and slender inflorescences.

SAPINDACEÆ

Genus **HARPULLIA** Roxburgh

Harpullia arborea (Blanco) Radlk. var. **megalocarpa** var. nov.

A typo differt fructibus multo majoribus, usque ad 5 cm longis et 9 cm latis, seminibus ellipsoideis, 2 cm longis.

LUZON, Rizal Province, Mount Sumag, Montalban, *Loher 13273*, April, 1912.

The specimens present no character by which they may be distinguished from the typical form of the species other than the very large fruits. These appear to be normal, for one contains a mature ellipsoid seed 2 cm in length.

RHAMNACEÆ

Genus **SAGERETIA** Brongniart

Sageretia hamosa Brongn.

Sageretia hamosa BRONGNIART in Ann. Sci. Nat. 10 (1826) 360; SCHNEIDER in Sargent Pl. Wils. 2 (1914) 230.

LUZON, Tayabas Province, Umirey region, *Loher 14009*, June, 1914.

The specimen agrees very closely with the published descriptions and undoubtedly represents Brongniart's species, although the petals are entirely glabrous. Previously recorded from India, Ceylon, Java, and Formosa.

DILLENIACEÆ

Genus **SAURAUIA** Willdenow

Saurauia loheri sp. nov.

Arbor parva, ramulis inflorescentiisque perspicue longe ciliato-setosis; foliis oblongo-lanceolatis, 9 ad 16 cm longis, 2.5 ad 4.5 cm latis, chartaceis, supra atro-olivaceis, subtus brunneis, tenuiter caudato-acuminatis, basi acutis ad subrotundatis, margine serratis, dentibus longe setosis, nervis utrinque circiter 15, perspicuis; inflorescentiis axillaribus, pedunculatis, cymosis, plerumque paucifloris, bracteatis, bracteis ovatis ad lanceolatis, 8 ad 12 mm longis, acuminatis, longe setosis; sepalis late ovatis, subacutis ad obtusis, 5 ad 6 mm longis, extus longe setosis, setae 3 ad 5 mm longae; petalis circiter 8 mm longis, inaequilateraliter retusis, glabris; staminibus 20, filamentis antherisque 3 mm longis; ovario pubescente, stylis 5, liberis, 3.5 mm longis.

A small tree, the branchlets, petioles, inflorescences, and the midrib on the lower surface of the leaves conspicuously setose-ciliate with slender, spreading, brownish hairs, 2 to 5 mm in length, the older branches glabrous, pale brown. Leaves oblong-lanceolate, chartaceous, 9 to 16 cm long, 2.5 to 4.5 cm wide, narrowed above to the slenderly caudate-acuminate apex, the base acute to somewhat rounded, margins serrate, the teeth tipped with long setæ, the upper surface atro-olivaceous, glabrous except for a few long setæ on the midrib, the lower surface brown, long-setose on the midrib and lateral nerves; primary nerves about 15 on each side of the midrib, prominent on the lower surface; petioles long-setose, 1 to 1.8 cm long. Cymes axillary, peduncled, mostly few-flowered, about 3 cm long, the bracts foliaceous, setose, ovate to lanceolate, acuminate, 8 to 12 mm long. Flowers about 1.8 cm in diameter, the sepals broadly ovate, 5 to 6 mm long, subacute to obtuse, the exterior ones densely long-setose in all parts, the interior ones setose only in the median parts. Petals somewhat obovate-oblong, inequilaterally retuse, about 8 mm long, 4 mm wide. Stamens 20, the filaments and anthers 3 mm long. Ovary pubescent; styles 5, glabrous, free to the base, about 3.5 mm long.

LUZON, Rizal Province, Montalban and Mount Sumag, *Loher 12073, 12300* (type), *12666*, April, May, and October.

A species strongly characterized by its numerous, long, spreading setæ, in some respects resembling *Saurauia clementis* Merr., but with very differently shaped, more numerously nerved leaves, pubescent ovaries, and 5 free styles, not 3 somewhat

united ones. There are numerous other points of difference between the two species.

GUTTIFERÆ

Genus **GARCINIA** Linnæus

Garcinia loheri sp. nov.

Arbor parva, glabra, ramis ramulisque teretibus, ramulis circiter 1 mm diametro; foliis parvis, pallidis vel olivaceis, ellipticis ad oblongo-ellipticis, 3.5 ad 6 cm longis, obtusis ad rotundatis, basi acutis, margine leviter recurvatis, nervis utrinque 15 ad 20, tenuibus, nervillis destitutis; floribus ♂ axillaribus, sessilibus, solitariis vel fasciculatis, 4-meris, sepalis orbicularis vel reniformibus, circiter 1.3 mm longis; antheris 5, sessilibus, erectis, distinctis, rimis longitudinaliter dehiscentibus, 1.2 mm longis; fructibus subglobosis, circiter 2 cm diametro, 6-locellatis, in siccitate plus minusve angulatis.

A small glabrous tree, the branches and branchlets terete, the branchlets slender, about 1 mm in diameter, internodes usually short. Leaves chartaceous to subcoriaceous, elliptic to oblong-elliptic, 3.5 to 6 cm long, 2 to 3 cm wide, apex rounded to obtuse, base acute, margins usually slightly recurved, pale or olivaceous when dry; lateral nerves 15 to 20 on each side of the midrib, slender, anastomosing with the equally slender submarginal nerve near the edge of the leaf, the reticulations indistinct; petioles about 5 mm long. Male flowers solitary or fascicled, 4-merous, axillary, sessile, the buds globose, 2 to 3 mm in diameter. Sepals orbicular to reniform, about 1.3 mm long, the petals similar to the sepals. Rudimentary ovary none. Stamens 5, sessile, erect, the anthers free, 0.5 mm long, dehiscing longitudinally. Fruit subglobose, about 2 cm in diameter, 6-celled, when dry somewhat angled.

LUZON, Rizal Province, Montalban and Oriud, *Loher 12339, 12880, 14077* (type), flowering in April and March, fruiting in October.

A species belonging in the same group with *Garcinia rubra* Merr., but with very different floral and leaf characters.

FLACOURTIACEÆ

Genus **HOMALIUM** Jacquin

Homalium obovatum sp. nov. § *Blackwellia.*

Arbor, inflorescentiis exceptis glabra; foliis obovatis, integris, nitidis, subcoriaceis, 5 ad 7 cm longis, basi acutis, apice pler-

umque late rotundatis, nervis primariis utrinque circiter 7, distinctis; paniculis axillaribus, foliis aequantibus vel multo longioribus, usque ad 12 cm longis, perspicue ciliatis; floribus 7- vel 8-meris, sepalis ciliatis, lineari-lanceolatis, acutis vel acuminatis, 3 mm longis; petalis oblanceolatis, obtusis, ciliatis, quam sepalis duplo latioribus; antheris 7 vel 8, filamentis ciliatis; stylis 4, ciliatis, tenuibus, 2 mm longis, subpatulis.

A tree, entirely glabrous except the conspicuously cinereous-ciliate inflorescences, the branches terete, grayish, branchlets usually reddish brown. Leaves obovate, entire, glabrous, shining, olivaceous, paler beneath, 5 to 7 cm long, 3 to 5 cm wide, base acute, apex usually broadly rounded, sometimes shortly and broadly obtuse-acuminate; primary lateral nerves about 7 on each side of the midrib, distinct, arched-anastomosing, the reticulations distinct; petioles 3 to 8 mm long. Inflorescences paniculate, axillary, peduncled, equaling or longer than the leaves, sometimes attaining a length of 12 cm, prominently ciliate, the indumentum cinereous. Flowers 7- or 8-merous, numerous, white, about 7 mm in diameter, the perianth tube subcylindric, somewhat narrowed below, sulcate, ciliate, 2 to 2.5 mm long. Sepals and petals cinereous-ciliate, about 3 mm long, the former narrowly linear-lanceolate, acute, the latter oblong-oblanceolate, obtuse, base cuneate, twice as wide as the sepals. Stamens one opposite each petal, the filaments ciliate, 3 mm long. Ovary ciliate, the styles 4, about 2 mm long, ciliate, narrowed upward to the slender, somewhat spreading tips.

LUZON, Rizal Province, Montalban (Guinuisan and Lucutan), *Loher 12200, 12811, 12871, 14752* (type), flowering in March, July, and September; a medium-sized tree.

A species superficially resembling *Homalium panayanum* F.-Vill., but remote from that species as described by F.-Villar, and as the description is corrected by Vidal, the flowers as to sepals, petals, and stamens being isomerous. Its true alliance is probably with *Homalium subscandens* Elm., which I have apparently erroneously reduced to *Homalium panayanum* F.-Vill.

Homalium polillense sp. nov. § *Myriantheia.*

Arbor, ramulis inflorescentiisque perspicue cinereo-villosis, subtus foliis leviter villosis; foliis ellipticis vel oblongo-ellipticis, 7 ad 9 cm longis, breviter acuminatis, subcoriaceis, olivaceis, crenato-serratis, nervis utrinque circiter 6, subtus valde perspicuis; inflorescentiis paniculatis, ramis paucis, elongatis; floribus 7-

meris, circiter 10 mm diametro, haud fasciculatis, sepalis petalisque perspicue ciliatis, oblanceolatis, 3.5 ad 4.5 mm longis, acutis, circiter 0.6 mm latis; staminibus 21, filamentis 2.5 mm longis, deorsum ciliatis; stylis 6, villosis, tenuis, deorsum ciliatis, 2 mm longis; bracteolis lanceolatis, acuminatis, 2.5 mm longis.

A tree, the branchlets and inflorescences conspicuously cinereous-ciliate, the branches terete, glabrous, grayish. Leaves elliptic to oblong-elliptic, subcoriaceous, olivaceous, 7 to 9 cm long, 3.5 to 4.5 cm wide, base acute, apex shortly and bluntly acuminate, margins crenate-serrate, the teeth in younger leaves tipped beneath with a tuft of short hairs, the upper surface glabrous except for the more or less pubescent midrib, the lower surface sparingly and softly villous; lateral nerves about 6 on each side of the midrib, very prominent on the lower surface, anastomosing, the reticulations not prominent; petioles villous, about 4 mm long. Panicles in the upper axils, up to 15 cm long, the branches few, elongated, up to 10 cm long. Flowers numerous, racemosely arranged, solitary at the nodes of the branches, 7-merous, about 10 mm in diameter, the subtending bracteoles lanceolate, ciliate, acuminate, 2.5 mm long, the pedicels about 2 mm long. Sepals and petals similar, equal, ciliate, oblanceolate, acute, about 0.6 mm wide, 3.5 to 4.5 mm long, the perianth tube ciliate, sulcate, narrowed below, about 3 mm long. Stamens 3 opposite each petal, the filaments 2.5 mm long, ciliate below. Styles 6, ciliate below, slender, 2 mm long.

POLILLO, *Loher 14535*, May, 1908.

A species greatly resembling and manifestly closely allied to *Homalium villosum* Merr., differing in its larger flowers, longer sepals and petals, longer styles, and its lanceolate, acuminate bracteoles.

MYRTACEÆ

Genus **EUGENIA** Linnæus

Eugenia diospyrifolia sp. nov. § *Eueugenia.*

Arbor parva, ramulis et subtus foliis junioribus plus minusve ferrugineo-villosis, vetustioribus glabrescentibus; foliis subcoriaceis, oblongis ad oblongo-lanceolatis, 12 ad 17 cm longis, 3 ad 5 cm latis, petiolatis, in siccitate pallidis vel brunneis, utrinque subaequaliter angustatis, basi acutis, apice obtuse acuminatis, nervis utrinque circiter 10, tenuibus, obscuris, aliquando obsoletis vel subobsoletis; floribus parvis, axillaribus, sessilibus, solitariis vel depauperato fasciculatis, 4-meris, pubescentibus; fructibus globosis, glabris, 2 cm diametro.

A small tree, the younger parts distinctly ferruginous-villous, in age becoming glabrous or subglabrous. Branches and branchlets pale or brownish, terete, the former glabrous, the latter usually villous. Leaves subcoriaceous, oblong to oblong-lanceolate, 12 to 17 cm long, 3 to 5 cm wide, usually brown when dry, sometimes pale, the younger ones distinctly villous on the lower surface, sometimes on both surfaces, becoming glabrous or nearly so at maturity, subequally narrowed to the acute base and to the blunt-acuminate apex; lateral nerves slender, obscure, often obsolete or nearly so, when evident about 10 on each side of the midrib, reticulations obsolete; petioles 5 to 12 mm long, prominently channeled on the upper surface, usually pubescent. Flowers axillary, solitary or in few-flowered fascicles, sessile, pubescent, 4-merous, the buds obovoid, about 4 mm in diameter. Calyx pubescent, the lobes 2.5 to 3 mm long, ovate, subacute. Petals obovate, 3 mm long, their margins ciliate. Stamens numerous, the filaments short. Fruit globose, glabrous, about 2 cm in diameter, 1-seeded.

LUZON, Rizal Province, Montalban, *Loher 13307* (type), *13328*, *14879*, May and July, 1913 and 1915.

A distinct species of the section *Eueugenia* probably most closely allied to *Eugenia sargentii* Merr., but remote from that species.

Eugenia cordatilimba sp. nov. § *Jambosa*.

Arbor glabra, ramulis teretibus; foliis oppositis, sessilibus, oblongis ad oblongo-ellipticis, coriaceis, acutis, basi late rotundatis, cordatisque, subamplexicaulis, 20 ad 25 cm longis, 7 ad 9 cm latis, in siccitate pallidis, opacis, nervis utrinque circiter 20, distinctis, patulis, anastomosantibus; inflorescentiis terminalibus, subcorymbosis, 7 ad 10 cm longis, 10 ad 15 cm latis, e basi ramosis, multifloris; floribus purpureis, plerumque solitariis, in ramulis ultimis dispositis, pedicellatis, distincte 2-bracteolatis, 2 ad 2.5 cm longis, calycis infundibuliformibus, circiter 1 cm longis, deorsum angustatis, inaequaliter 4-lobatis, lobis late reniformibus, circiter 5 mm latis; petalis ovatis, glandulosis, liberis, circiter 6 mm longis; filamentis numerosis, 7 ad 14 mm longis.

A glabrous tree, the branches and branchlets terete, brownish, usually smooth, the ultimate branchlets about 7 mm in diameter. Leaves opposite, sessile, oblong to oblong-elliptic, coriaceous, acute, base broadly rounded, cordate, subamplexicaul, coriaceous, pale when dry, dull, 20 to 25 cm long, 7 to 9 cm wide; lateral

nerves about 20, distinct, spreading, somewhat curved, anastomosing with the nearly equally distinct marginal nerve 5 to 10 mm from the edge of the leaf, reticulations lax, slender, not prominent. Inflorescences terminal, subcorymbose, 7 to 10 cm long, 10 to 15 cm wide, many-flowered, branched from the base, the flowers purplish, all distinctly pedicelled, solitary, each ultimate branch usually bearing 3 flowers, the subtending bracteoles 2, deciduous, the pedicels up to 5 mm long. Calyx funnel-shaped, terete, about 1 cm long, narrowed below to the cuneate base, the limb of 4 broadly reniform lobes, the lobes up to 5 mm wide. Petals conspicuously glandular, ovate, about 6 mm long. Stamens indefinite, their filaments 7 to 14 mm long.

LUZON, Rizal Province, Balintingan, *Loher 12830, 14924* (type), March, 1909, and July, 1913; a medium-sized tree.

According to Robinson's arrangement of the Philippine species, this falls in the group with *Eugenia subrotundifolia* C. B. Rob., but it is not at all closely allied to any of the species placed here. It is strongly characterized by its oblong, acute, sessile, broadly rounded and cordate, subamplexicaul leaves, and its terminal, many-flowered inflorescences, which are branched from the base.

Eugenia crassilimba sp. nov. § *Jambosa.*

Arbor glabra, ramis ramulisque teretibus; foliis crasse coriaceis, sessilibus, lanceolatis, 20 ad 30 cm longis, 3 ad 5 cm latis, basi abrupte rotundatis cordatisque, subamplexicaulis, sursum gradatim angustatis, acutis vel acuminatis, margine plerumque incrassatis recurvatisque, nervis utrinque 15 ad 20, distantibus, distinctis, anastomosantibus; inflorescentiis terminalibus, pauciforis, subcorymbosis, 5 ad 10 cm longis, breviter pedunculatis, ramis paucis, floribus plerumque in triadibus dispositis, obscure bibracteolatis, purpureis, circiter 4 cm diametro; calycis infundibuliformibus circiter 2.5 cm longis, lobis 4, subreniformibus, circiter 1 cm latis; petalis orbiculari-ovatis, liberis, circiter 1.2 cm diametro; filamentis numerosis, circiter 1.5 cm longis.

A glabrous tree, the branches and branchlets terete, pale brownish or grayish, usually smooth, the ultimate branchlets 2 to 3 mm in diameter. Leaves thickly coriaceous, opposite, sessile, lanceolate, 20 to 30 cm long, 3 to 5 cm wide, the base abruptly and broadly rounded, distinctly cordate and subamplexicaul, gradually narrowed upward to the acute or somewhat acuminate apex, the margins usually thickened and recurved, when dry usually pale brownish, shining; lateral nerves 15 to 20

on each side of the midrib, distant, irregular, spreading, distinct, anastomosing directly with the equally prominent submarginal nerves which are only slightly arched. Inflorescences terminal, subcorymbose, few-flowered, 5 to 10 cm long, the rather large flowers mostly in threes at the tips of the branches, mostly shortly pedicellate, the subtending pair of bracteoles obscure. Flowers purplish, about 4 cm in diameter, the calyces terete, funnel-shaped, about 2 cm in diameter, narrowed below into a short pseudostalk, the lobes 4, subreniform, about 1 cm wide. Petals 4, free, orbicular-ovate, about 12 mm in diameter. Stamens indefinite, about 2 cm long.

LUZON, Rizal Province, Paningtingan, *Loher 14208*, February, 1913.

A species well characterized by its thickly coriaceous, lanceolate, elongate, sessile, cordate, subamplexicaul leaves, their margins usually revolute, its short terminal inflorescences, and its relatively large flowers. It probably belongs in the general group with *Eugenia merrillii* C. B. Rob.

Eugenia megalophylla sp. nov. § *Syzygium*.

Arbor glabra, ramulis crassis, circiter 2 cm diametro, teretibus, laevis; foliis permagnis, circiter 50 cm longis et latis, late ovatis vel suborbiculari-ovatis, coriaceis, in siccitate purpureo-brunneis utrinque concoloribus, nitidis, sessilibus, basi latissime rotundatus, obscure subcordatis, apice breviter abrupteque acuminatis, nervis utrinque 20 ad 25, valde perspicuis, anastomosantibus; inflorescentiis terminalibus, pedunculatis, usque ad 30 cm longis, pyramidatis, ramis inferioribus usque ad 15 cm longis, patulis; floribus in triadibus dispositis, brevissime pedicellatis, bibracteolatis, calycis teretibus, circiter 11 mm longis, truncatis, apice circiter 5 mm diametro, deorsum angustatis; petalis calyptratim deciduis, calyptra 5 mm diametro; filamentis numerosis, 4 ad 11 mm longis.

A grabrous tree, the branchlets thick, terete, smooth, about 2 cm in diameter, pale brownish when dry. Leaves broadly ovate to suborbicular-ovate, about 50 cm long and wide, coriaceous, brownish purple and shining on both surfaces when dry, sessile, the base very broadly rounded, shallowly and obscurely subcordate, the apex abruptly short-acuminate; lateral nerves 20 to 25 on each side of the midrib, very prominent on both surfaces, somewhat curved, anastomosing with the distinct submarginal nerve 5 to 10 mm from the edge of the leaf, the primary reticulations subparallel, lax, distinct. Panicles terminal, pyram-

idal, up to 30 cm long and wide, the peduncle about 10 cm long, terete, nearly 1 cm in diameter, the ultimate branchlets obscurely angled. Flowers white, borne in triads at the tips of the ultimate branchlets, bibracteolate, the pedicels stout, very short (1 to 2 mm long), the calyces about 11 mm long, terete, truncate, the mouth about 5 mm in diameter, gradually narrowed below into a pseudostalk. Petals united into a deciduous calyptra 5 mm in diameter. Stamens numerous, their filaments 4 to 11 mm long.

LUZON, Tayabas Province, Umirey region, *Loher 13596*, May, 1915.

A remarkable species on account of its enormous leaves, not closely related to any previously described form.

ERICACEÆ

Genus **VACCINIUM** Linnæus

Vaccinium rizalense sp. nov.

Arbor parva, inflorescentiis exceptis glabra; foliis crasse coriaceis, ellipticis ad oblongo-ellipticis, 6 ad 9 cm longis, breviter acuminatis, basi acutis, in siccitate supra olivaceis vel pallide olivaceis, subtus brunneis, nervis utrinque 2 vel 3, tenuibus, adscendentibus; racemis axillaribus, leviter pubescentibus, solitariis vel fasciculatis, 4 ad 8 cm longis, bracteis subpersistentibus, oblongis, subacutis, leviter pubescentibus, 8 mm longis; floribus ovoideis, 5 mm longis, extus leviter adpresse pubescentibus, corolla sursum contracta, lobis ovatis, reflexis, 1 mm longis; filamentis 1.5 mm longis, leviter ciliatis, antheris oblongis, apice breviter productis, filamentis subaequantibus; ovario pubescente, stylis cylindricis, glabris, 4 mm longis.

A tree, glabrous except the sparingly pubescent inflorescences, the branches rugose, dark reddish brown. Leaves thickly coriaceous, elliptic to oblong-elliptic, 6 to 9 cm long, 3 to 4.5 cm wide, the apex shortly and bluntly acuminate, the base acute, margins somewhat reflexed, the upper surface olivaceous or pale olivaceous when dry, the lower surface brown, somewhat glandular-punctate; lateral nerves 2 or 3 on each side of the midrib, slender, ascending, reticulations obscure; petioles stout, 1 cm long or less. Racemes axillary, solitary or fascicled, 4 to 8 cm long, many-flowered, slightly appressed-pubescent, the bracts oblong, subpersistent, about 8 mm long, 3.5 mm wide, acute or slightly acuminate, the bracteoles acuminate, 2 mm long. Flowers purple, externally slightly appressed-pubescent, 5 mm long, their pedicels 2.5 to 4 mm long. Calyx somewhat pubescent, the tube

very short, the lobes triangular, acute, 1.2 mm long. Corolla ovoid, inflated below and nearly 3 mm in diameter, contracted above and 1 to 1.2 mm in diameter at the apex, the lobes broadly ovate, subacute, reflexed, 1 mm long. Filaments thickened below, somewhat pubescent, 1.5 mm long, the anthers oblong, equaling the filaments, slightly produced at their apices. Ovary pubescent; style cylindric, glabrous, 4 mm long.

LUZON, Rizal Province, Guinuisan and Balacbac, *Loher 12150, 14979* (type), June and July, 1909 and 1912.

A species closely allied to *Vaccinium platyphyllum* Merr., differing in its much smaller leaves.

Genus **DIPLYCOSIA** Blume

Diplycosia loheri sp. nov.

Frutex ut videtur scandens, ramulis et pedicellis et calycis perspicue patule ciliato-setosis; foliis elliptico-ovatis, subcoriaceis, obscurissime nervosis, 2.5 ad 4 cm longis, acuminatis, basi obtusis ad subrotundatis, utrinque margineque parce setoso-ciliatis; floribus axillaribus, solitariis vel binis, rariter trinis, tenuiter pedicellatis, pedicellis 1 ad 2.5 cm longis; corolla turbinata, glabra, 5.5 mm longa, lobis late ovatis, reflexis, 1.5 mm longis; filamentis glabris, 2 ad 2.5 mm longis, antheris circiter 1.4 mm longis, apice breviter productis.

A shrub, apparently scandent, the branchlets, pedicels, and calyces conspicuously ciliate-setose with numerous, reddish brown, spreading hairs 0.5 to 3 mm long, similar but more-scattered hairs on both surfaces of the leaves and on their margins. Branches glabrous, dark when dry, the branchlets paler, the ultimate ones 1 to 1.5 mm in diameter. Leaves subcoriaceous, elliptic-ovate, somewhat acuminate, base obtuse to rounded, olivaceous on the upper surface when dry, paler beneath, 2.5 to 4 cm long, 1.5 to 2.5 cm wide, the nerves obscure, frequently only a subbasal pair, never more than two pairs, evanescent, reticulations obsolete; petioles ciliate-setose, 2 to 3 mm long. Flowers axillary, solitary or in pairs or threes, their slender, conspicuously ciliate-setose, slender pedicels 1 to 2.5 cm long. Calyces densely and conspicuously ciliate-setose, the tube about 3 mm long, the lobes triangular, acute, less than 1 mm long. Corolla glabrous, somewhat turbinate, 5.5 mm long, the lobes recurved, broadly ovate, obtuse, 1.5 mm long. Filaments glabrous, 1.5 to 2 mm long, the anthers about 1.4 mm long, their apices somewhat produced.

LUZON, Nueva Vizcaya Province, Caraballo Mountains, *Loher 13693*, March, 1915.

A remarkably distinct species, distinguished among all hitherto known Philippine forms by its conspicuously ciliate-setose calyces, the setæ being reddish brown, spreading, 0.5 to 2.5 mm in length, similar to those on the long slender pedicels, the branchlets, petioles, and leaves. The scattered setose hairs on the lower surface of the leaves spring from small dark-colored glands, these glands persisting after the setæ fall.

MYRSINACEÆ

Genus **EMBELIA** Burman f.

Embelia loheri sp. nov. § *Pattara.*

Frutex scandens, inflorescentiis exceptis glaber, ramis ramulisque tenuibus, foliis chartaceis, lanceolatis, usque ad 9 cm longis et 2.5 cm latis, haud glandulosis, tenuiter acuminatis, basi acutis, margine perspicue serratis, nervis primariis utrinque 8 ad 10, distinctis, anastomosantibus; racemis axillaribus, solitariis, 3 ad 7 cm longis, breviter pubescentibus; floribus circiter 4 mm diametro, sepalis oblongo-ovatis, 1 mm longis, leviter pubescentibus, subacutis, partibus superioribus parce glandulosis; petalis ellipticis, symmetricis, liberis, 2 mm longis, extus glabris, intus puberulis, rotundatis, partibus superioribus perspicue glandulosis; filamentis petalis aequilongis, antheris 0.5 mm longis, obtusis, connectivo glanduloso.

A scandent shrub, glabrous except the papillose-pubescent inflorescences. Branches and branchlets slender, pale, terete. Leaves lanceolate, brownish olivaceous, paler and usually brown beneath, chartaceous, 4 to 9 cm long, 1.5 to 2.5 cm wide, narrowed above to the rather slenderly acuminate apex and below to the acute base, the margins especially in the upper two-thirds or three-fourths conspicuously serrate, the teeth rather distant, acuminate; lateral nerves 8 to 10 on each side of the midrib, distinct, anastomosing, the reticulations distinct; petioles about 4 mm long. Racemes solitary, in the axils of normal leaves, 3 to 7 cm long, papillose-pubescent with short hairs, many-flowered. Flowers reddish, 4 mm in diameter, their pedicels slender, 5 mm long, papillose-pubescent, the bracteoles lanceolate, acuminate, 1 to 1.2 mm long, pubescent, glandular. Calyx 2 mm in diameter, the lobes oblong-ovate, 1 mm long, subacute, slightly pubescent, with scattered conspicuous glands in the upper half. Petals

free, symmetric, elliptic, rounded, glabrous externally, puberulent inside, 2 mm long, with scattered conspicuous glands in the upper half. Stamens as long as the petals, the anthers ovoid, obtuse, 0.5 mm long, connectives glandular. Ovary and style glabrous, 1 mm long.

LUZON, Rizal Province, Paningtingan and Oriud, *Loher 13162, 13845* (type), March, 1912 and 1914.

A species belonging in the group with *Embelia tsjeriam-cottam* A. DC., its closest ally among the known Philippine forms being *Embelia luzoniensis* Merr., from which it is distinguished by its lanceolate, sharply toothed leaves and its much longer racemes.

SAPOTACEÆ

Genus **PALAQUIUM** Blanco

Palaquium elliptilimbum sp. nov.

Arbor, novellis, pedicellis, calycis, et foliis junioribus subtus minutissime adpresse pubescentibus, foliis vetustioribus utrinque glaberrimis; foliis ellipticis, coriaceis, 6 ad 9 cm longis, 3.5 ad 5.5 cm latis, brunneo-olivaceis, brevissime obtuseque acuminatis, basi acutis vel decurrento-acuminatis, nervis utrinque circiter 8, distinctis, reticulis obsoletis vel subobsoletis, petiolo 1.5 ad 3 cm longo; floribus numerosis, fasciculatis, plerumque in axillis defoliatis, sepalis ovatis, coriaceis, obtusis vel rotundatis, circiter 3 mm longis; staminibus 12; ovario 6-loculare.

A tree, the very young parts, pedicels, calyces, and the lower surfaces of younger leaves densely and minutely pubescent with golden brown, appressed hairs, the older leaves entirely glabrous. Branches pale brownish, rugose, the ultimate branchlets about 2 mm in diameter, nearly glabrous. Leaves coriaceous, elliptic, 6 to 9 cm long, 3.5 to 5.5 cm wide, shortly and obtusely acuminate, base acute or decurrent-acuminate, brownish or olivaceous when dry, rather dull; lateral nerves about 8 on each side of the midrib, slender, distinct, the reticulations obsolete or nearly so; petioles 1.5 to 3 cm long. Flowers very numerous, fascicled on the branches below the leaves, few in the leaf axils on the ultimate branchlets, their pedicels rather slender, appressed-pubescent, about 2.5 cm long. Sepals coriaceous, ovate to broadly ovate, rounded to obtuse, minutely appressed-pubescent on the back, the outer three thicker than the inner ones, the latter usually with glabrous margins. Corolla tube glabrous, cylindric, 3 mm long, the lobes reflexed in anthesis, oblong-elliptic, about

6 mm long, 2.8 mm wide, acute. Stamens 12, their filaments 3 mm long, glabrous, the anthers oblong-ovate, prominently apiculate-acuminate, 3 to 4 mm long. Ovary 6-celled; style 11 mm long.

LUZON, Rizal Province, Montalban, *Loher 12170, 13867* (type), in full anthesis in January.

A species resembling *Palaquium glabrum* Merr. in many respects, but with 12 instead of 18 stamens, pubescent in many parts, and with smaller and fewer-nerved leaves.

Palaquium loheri sp. nov.

Arbor, ramulis junioribus, pedicellis, calycis, et subtus foliis praesertum ad costa perspicue castaneo-tomentosis; foliis subcoriaceis, oblongo-obovatis, 8 ad 13 cm longis, obtusis ad breviter obtuse acuminatis, deorsum angustatis, basi cuneatis, nervis utrinque circiter 8, distinctis; floribus numerosis, fasciculatis, plerumque e axillis defoliatis, pedicellis 1.5 ad 2 cm longis; sepalis exterioribus extus dense castaneo-tomentosis, late ovatis, subacutis, 3 mm longis, interioribus suborbicularis, rotundatis; corollae tubo circiter 2 mm longo, lobis oblongo-ovatis, 5 ad 6 mm longis, glabris, obtusis; staminibus 12, filamentis 3 mm longis, antheris oblongo-ovatis, apiculatis, 2 mm longis; ovario glabro, 6-loculare, stylis 12 mm longis.

A tree, the young branchlets, pedicels, calyces, and the midrib on both surfaces of the leaves densely castaneous-tomentose, the branches stout, glabrous, grayish. Leaves oblong-obovate, subcoriaceous, 8 to 13 cm long, 3 to 4.5 cm wide, obtuse to shortly and bluntly acuminate, narrowed below to the cuneate base, the upper surface atro-olivaceous, glabrous except for the tomentose midrib, the lower surface purplish brown, densely tomentose on the midrib, the surface of the lamina sparingly tomentose; lateral nerves about 8 on each side of the midrib, prominent, the reticulations nearly obsolete; petioles about 1.5 cm long, densely tomentose. Flowers numerous, fascicled, chiefly in the axils of fallen leaves, their pedicels 1.5 to 2 cm long, densely castaneous-tomentose, as are the sepals. Outer sepals broadly ovate, subacute, about 3 mm long, the inner ones suborbicular, thinner, less pubescent than the outer ones, rounded. Corolla glabrous, the tube about 2 mm long, the lobes erect or somewhat spreading, possibly ultimately reflexed, oblong-ovate, obtuse, 5 to 6 mm long. Stamens 12, their filaments 3 mm long, the anthers oblong-ovate, apiculate, 2 mm long. Ovary glabrous, 6-celled; style 12 mm long.

LUZON, Rizal Province, Montalban, *Loher 12396* (type), *13208*, January, 1914.

A species recognizable by its few-nerved, oblong-obovate, obtuse leaves and its castaneous indumentum. Though belonging in the same group with *Palaquium elliptilimbum*, it differs entirely in its vegetative and indumentum characters.

OLEACEÆ

Genus **LINOCIERA** Swartz

Linociera phanerophlebia sp. nov.

Frutex vel arbor parva, inflorescentiis exceptis glabra, ramis ramulisque teretibus, pallidis vel brunneis; foliis coriaceis, oblongis, 10 ad 14 cm longis, perspicue obtuseque acuminatis, basi acutis, in siccitate pallide olivaceis vel brunneis, nervis utrinque 5 ad 7, subtus valde perspicuis arcuato-anastomosantibus, reticulis laxissimis, obscuris vel obsoletis; inflorescentiis axillaribus, plus minusve cinereo-pubescentibus, multifloris, 3 ad 6 cm longis; floribus sessilibus, plerumque confertis, calycis cupulatis, leviter pubescentibus, 4-lobatis, corollae tubo circiter 1 mm longo, lobis 4, oblongis, obtusis, glabris, margine incurvatis, circiter 4 mm longis.

A shrub or small tree, glabrous except the more or less cinereous-pubescent inflorescences. Branches usually pale, terete, the branchlets reddish brown, slender. Leaves coriaceous, oblong, 10 to 14 cm long, 3.5 to 5 cm wide, the apex conspicuously and obtusely acuminate, base acute, pale olivaceous or brownish when dry; lateral nerves 5 to 7 on each side of the midrib, very prominent on the lower surface, scarcely evident on the upper surface, arched-anastomosing, the reticulations very lax, obscure or obsolete; petioles 6 to 10 mm long. Inflorescences axillary, somewhat cinereous-pubescent, many-flowered, 3 to 6 cm long, branched from or near the base, the flowers crowded, sessile, 4-merous. Calyx cup-shaped, 2.5 mm long, somewhat pubescent, the lobes triangular-ovate, acute or obtuse, 1 mm long. Corolla tube about 1 mm long, the lobes oblong, glabrous, obtuse, about 4 mm long, their margins incurved. Anthers ellipsoid, 1.2 mm long. Ovary ovoid, glabrous, 1.5 mm long, the style very short.

LUZON, Rizal Province, Montalban and Bantol, *Loher 12930*, *14138*, *14220*, *14222* (type), February and March, 1913.

A species well characterized by its very conspicuous, few-nerved leaves, the nerves scarcely evident on the upper surface,

strongly projecting and arched-anastomosing on the lower surface, the reticulations lax, faint or obsolete. It belongs in the group with *Linociera coriacea* Vidal, but has much smaller, fewer-nerved leaves.

LOGANIACEÆ

Genus **FAGRAEA** Thunberg

Fagraea loheri sp. nov.

Frutex glaber, ramulis circiter 3 mm diametro, internodiis brevibus; foliis coriaceis, in siccitate fragilis, brunneis ad atro-olivaceis, plerumque minutissime verruculosis, oblongis ad ellipticis, 6 ad 9 cm longis, acute acuminatis, basi acutis, nervis lateralibus obsoletis; floribus terminalibus, solitariis, binis vel trinis, circiter 3 cm longis, pedicellis crassis, circiter 8 mm longis; calycis tubo 8 mm diametro, lobus late ovatis, obtusis, circiter 4 mm longis; corollae tubo 11 mm longo, lobis ellipticis, obtusis, 16 mm longis; fructibus in siccitate atris, oblongo-ovoideis, acutis, circiter 3 cm longis.

An entirely glabrous shrub, the branchlets about 3 mm in diameter, the internodes 5 to 10 mm in length. Leaves coriaceous, brittle when dry, brown to dark olivaceous, dull, usually minutely verruculose, oblong to elliptic, 6 to 9 cm long, 2 to 4 cm wide, conspicuously and sharply acuminate, base acute, the lateral nerves obsolete; petioles 1 to 1.8 cm long, rather slender, inflated and clasping at the base. Flowers terminal, solitary, in pairs or in threes, about 3 cm long, the pedicels stout, 8 mm long, somewhat elongated in fruit, the bracteoles ovate, about 2 mm long, obtuse, persistent. Calyx thickly coriaceous, the tube about 8 mm in diameter, 1.5 cm long or less, accrescent in fruit, narrowed below, the lobes broadly ovate, obtuse, about 4 mm long, 6 mm wide at the base. Corolla tube about 11 mm long, the lobes elliptic, obtuse, 16 mm long, 8 mm wide. Filaments about 13 mm long, the oblong-ellipsoid anthers nearly one-half as long. Fruits, when dry, black, oblong-ovoid, acute, about 3 cm long.

LUZON, Rizal Province, Montalban and Mabiluang, *Loher 12056, 12324, 13270, 14464* (type): Nueva Vizcaya Province, Caraballo Mountains, *Loher 13692,* in flower in October, in fruit in March and September.

A species manifestly belonging in the group with *Fagraea obovata* Wall., from which it is distinguished by its much smaller, acutely acuminate leaves and its smaller flowers.

APOCYNACEÆ

Genus **RAUWOLFIA** Linnæus

Rauwolfia loheri sp. nov.

Frutex vel arbor parva, glabra, ramis teretibus, ramulis leviter compressis; foliis membranaceis, verticillatis, oblongis ad oblongo-lanceolatis, usque ad 20 cm longis et 4 cm latis, basi acutis, apice acutis vel breviter acuminatis, in siccitate supra olivaceis, subtus pallidis, nervis utrinque circiter 18, distinctis; cymis terminalibus, pedunculatis, circiter 10 cm longis, pauciforis, calycis lobis lanceolatis, acuminatis, 1.5 ad 2.5 mm longis, corollae tubo 1 cm longo, lobis saltem 4 mm longis; fructibus circiter 1 cm longis, oblongo-ellipticis.

A glabrous shrub or small tree, the branches terete, pale brownish, shining, smooth, not lenticellate, the branchlets slender, slightly compressed, 1.5 to 2 mm in diameter, olivaceous. Leaves verticillate, mostly in threes, membranaceous, oblong, 10 to 20 cm long, 2.5 to 4 cm wide, subequally narrowed to the acute base and to the acute or slightly acuminate apex, the upper surface olivaceous, the lower surface pale, smooth; lateral nerves about 18 on each side of the midrib, slender, prominent, anastomosing, the reticulations lax, distinct; petioles 1 to 1.3 cm long. Inflorescences terminal, peduncled, slender, about 10 cm long, cymose, the flowers somewhat fascicled on the ultimate branches, their pedicels about 6 mm long. Calyx lobes lanceolate, acuminate, 1.5 to 2.5 mm long. Corolla tube about 1 cm long, inflated in the middle, slender, glabrous externally, the throat bearded, the lobes oblong, at least 4 mm long. Anthers 1.5 mm long. Disk cylindric, truncate, about 1 mm in diameter, 0.6 mm high. Fruit oblong-ellipsoid, obtuse, about 1 cm long, somewhat rugose when dry.

LUZON, Rizal Province, Montalban, *Loher 12500*, June, 1909, flowers pink.

The fourth species of the genus to be found in the Philippines, apparently closely allied to *Rauwolfia verticillata* Baill. of China.

Genus **PARSONSIA** R. Brown

Parsonsia oblongifolia sp. nov.

Scandens, glabra vel subglabra, foliis oblongis ad lanceolatis, coriaceis, 7 ad 10 cm longis, 2 ad 2.5 cm latis, in siccitate brunneo-olivaceis, nitidis, subtus pallidis, apice acutis vel breviter

acuminatis, basi obtusis ad acutis, nervis utrinque circiter 8, patulis, anastomosantibus, reticulis obsoletis. Inflorescentiis longe pedunculatis, cymosis, circiter 6 cm diametro; floribus breviter pedicellatis, sepalis oblongo-ovatis, obtusis, 2 mm longis, corollae tubo 3 mm longo, lobis anguste oblongis, obtusis, 5 mm longis; filamentis spiraliter contortis, leviter villosis, antheris anguste lanceolatis, 3 mm longis; folliculis anguste lanceolatis, 14 cm longis.

Scandent, somewhat woody, glabrous or nearly so, the branches and branchlets pale or brownish, the latter minutely verruculose. Leaves opposite, coriaceous, oblong to lanceolate, 7 to 10 cm long, 2 to 2.5 cm wide, glabrous, brownish olivaceous, shining, the lower surface pale, apex acute to shortly acuminate, base obtuse to acute; nerves about 8 on each side of the midrib, rather thick, spreading, anastomosing, the reticulations obsolete; petioles 1 to 1.3 cm long. Inflorescences cymose, slightly pubescent, about 6 cm in diameter, their peduncles up to 5 cm in length. Pedicels 4 to 8 mm long, the subtending bracteoles ovate, acute, about 1 mm long. Calyx lobes oblong-ovate, obtuse, 2 mm long, eglandular. Corolla tube 3 mm long, glabrous, throat not bearded, the lobes narrowly oblong, obtuse, 5 mm long. Disk lobes 5, fleshy, narrowly ovoid, 1 mm long. Filaments spirally twisted, slightly villous, the anthers narrowly lanceolate, 3 mm long. Follicles narrowly lanceolate, acuminate, about 14 cm long, less than 1 cm in diameter.

LUZON, Rizal Province, Paningtingan, *Loher 13477*, March, 1915.

A species allied to *Parsonsia oblancifolia* Merr., differing in its coriaceous, differently shaped leaves, and in its long-peduncled inflorescences.

Genus **CARRUTHERSIA** Seemann

Carruthersia axilliflora sp. nov.

Frutex scandens, ramulis foliisque subtus ad costa nervisque parce ciliato-setosis; foliis oblongis, chartaceis, acuminatis, basi rotundatis, 6 ad 10 cm longis, nervis utrinque circiter 9, perspicuis; inflorescentiis axillaribus floribus fasciculatis vel solitariis, breviter pedicellatis, glabris, circiter 1 cm diametro, corollae tubo 6 mm longo, intus dense villoso.

A slender scandent shrub, the branches terete, glabrous, about 2 mm in diameter, the branchlets sparingly ciliate-setose, the pale spreading hairs 1 to 1.5 mm long, similar hairs on the upper

surfaces of young leaves, and on the midrib and nerves of mature leaves beneath. Leaves oblong, chartaceous, 6 to 10 cm long, 2 to 4.5 cm wide, base rounded, apex conspicuously acuminate, the upper surface pale olivaceous, the lower surface brown when dry; lateral nerves about 9 on each side of the midrib, very prominent on the lower surface, arched-anastomosing, the reticulations lax, distinct; petioles 4 to 10 mm long, the younger ones ciliate-setose, the older ones glabrous. Flowers axillary, solitary or in very few-flowered fascicles, their pedicels about 3 mm long, the bracteoles broadly ovate, 0.5 mm long. Calyx about 2 mm long and wide, glabrous, narrowed below, the lobes triangular-ovate, acute, 1 mm long. Corolla tube slender, glabrous externally, about 6 mm long, distinctly inflated about 1.5 mm above the base, the lobes spreading, somewhat falcate, about 5 mm long and 2 mm wide, inequilaterally rostrate-acuminate, the tube and throat inside densely villous. Anthers inserted in the inflated part of the tube, narrowly lanceolate, acuminate, base obtuse, not united to the stigma, 1.2 mm long. Carpels 2, glabrous, about 1 mm long, the style and stigma 1.5 mm long, the ovules numerous in each carpel.

LUZON, Rizal Province, Montalban, *Loher 12351*, October, 1909.

A very strongly marked species characterized by its small, axillary, solitary or fascicled flowers and by the scattered, ciliate-setose hairs on the younger branchlets and petioles and on the midrib and lateral nerves on the lower surface of the mature leaves.

Genus **MELODINUS** Forster

Melodinus lanceolatus sp. nov.

Frutex scandens partibus junioribus inflorescentiisque exceptis glaber, ramis glabris, ramulis leviter pubescentibus; foliis lanceolatis, junioribus leviter pubescentibus, vetustioribus glabris, coriaceis, lanceolatis, in siccitate brunneis, 5 ad 10 cm longis, 1.5 ad 2.5 cm latis, basi acutis, apice obtuse acuminatis, nervis primariis utrinque circiter 20, tenuibus; inflorescentiis brevibus, terminalibus, paucifloris; corollae tubo 11 mm longi, extus cinereo-pubescente, intus dense villoso, lobis oblongo-ellipticis, 8 mm longis, 4 mm latis, obtusis, extus pubescentibus; sepalis oblongo-ovatis, acutis vel leviter acuminatis, 3.5 mm longis, extus pubescentibus.

A scandent shrub, glabrous except the younger parts and the inflorescences, the branches terete, dark when dry, the branchlets, young leaves, and inflorescences pubescent with short hairs.

Leaves lanceolate, coriaceous, usually brown when dry, in maturity entirely glabrous, 5 to 10 cm long, 1.5 to 2.5 cm wide, base acute, narrowed upward to the blunt-acuminate apex, the lateral nerves about 20 on each side of the midrib, slender, not conspicuous; petioles about 5 mm long. Cymes terminal, short, rather few-flowered, shorter than the normal leaves, the flowers intermixed with reduced leaves. Pedicels 2 to 3 mm long, the bracteoles ovate, acute, pubescent, 2 mm long. Sepals oblong-ovate, acute or somewhat acuminate, 3.5 mm long, pubescent externally. Corolla tube pubescent externally, densely villous inside, somewhat widened upward, 11 mm long, the lobes coriaceous, oblong-elliptic, obtuse, 8 mm long, 4 mm wide, pubescent outside. Anthers narrowly lanceolate, 1.5 mm long, acuminate, the short filaments villous.

LUZON, Rizal Province, without definite locality, *Loher 15057*.

A species allied to *Melodinus cumingii* A. DC., but with smaller, narrower leaves and acute or acuminate calyx segments.

ASCLEPIADACEÆ

Genus **TYLOPHORA** R. Brown

Tylophora lancilimba sp. nov.

Herbacea, scandens, glabra, ramis striatis, 2 mm diametro; foliis lanceolatis, membranaceis, in siccitate pallidis, 6 ad 13 cm longis, 7 ad 15 mm latis, tenuiter acuminatis, basi subacutis ad abrupte truncato-subrotundatis, nervis utrinque circiter 15, patulis, obscuris, anastomosantibus, petiolo 1 ad 1.5 cm longo; inflorescentiis axillaribus, laxis, multifloris, 10 ad 12 cm longis; floribus circiter 4.5 mm diametro, petalis oblongo-ovatis, obtusis, 2.2 mm longis, sepalis oblongo-lanceolatis, 1 mm longis, corona 1 mm diametro.

A slender, herbaceous, glabrous vine, the branches striate, 2 mm in diameter, greenish olivaceous when dry. Leaves lanceolate, membranaceous, 6 to 13 cm long, 7 to 15 mm wide, narrowed upward to the slenderly and acutely acuminate apex, the base subacute to rather abruptly subtruncate-rounded, pale when dry; lateral nerves slender, indistinct, anastomosing, spreading, about 15 on each side of the midrib, the reticulations nearly obsolete; petioles 1 to 1.5 cm long. Inflorescences axillary, diffuse, lax, spreading, many-flowered, 10 to 12 cm long, the pedicels slender, up to 1 cm in length, the flowers fascicled at the nodes of the inflorescence branches. Sepals oblong-lanceolate, 1 mm long.

Petals oblong-ovate, obtuse, 2.2 mm long. Corona ovoid, 1 mm in diameter.

LUZON, Rizal Province, without definite locality, *Loher 14834*, August, 1914.

A strongly marked species, well characterized by its long, slender, lanceolate, slenderly acuminate leaves and its very lax inflorescences.

ACANTHACEÆ

Genus **GYMNOSTACHYUM** Nees

Gymnostachyum trichosepalum sp. nov.

Herba erecta, omnibus partibus cinereo-pubescentibus; foliis membranaceis, ovatis, 4 ad 6 cm longis, acutis vel obtusis, basi rotundatis, nervis utrinque circiter 4, obscuris; spicis longis, tenuibus, 15 ad 20 cm longis, bracteis lineari-lanceolatis, tenuiter acuminatis, 4 mm longis, dense capitato-pubescentibus; sepalis lineari-lanceolatis, capitato-glandulosis, tenuiter acuminatis, quam bracteis paullo longioribus; capsulis circiter 12 mm longis, pubescentibus, seminibus 8.

An erect herb, all parts rather densely cinereous-pubescent, the stems usually unbranched, about 3 mm in diameter, somewhat woody below. Leaves ovate, 4 to 6 cm long, membranaceous, acute or obtuse, base rounded, rarely subacute, the lateral nerves obscure, usually 4 on each side of the midrib; petioles densely pubescent, 1 to 2 cm long. Spikes slender, 15 to 20 cm long, densely pubescent with short, cinereous, capitate-glandular hairs, the flowers numerous, solitary. Bracts linear-lanceolate, slenderly acuminate, about 4 mm long, densely covered with short, cinereous, capitate-glandular hairs. Sepals similar to the bracts but slightly longer. Corolla not seen. Capsules cinereous-pubescent, about 12 mm long, the valves recurved, seeds usually 8.

LUZON, Rizal Province, Paningtingan, *Loher 13484*, March, 1915.

A strongly marked species, well characterized by its indumentum and especially by its elongate slender spikes, the rachis, bracts, and sepals being densely capitate-glandular with short cinereous hairs.

Genus **PERISTROPHE** Nees

Peristrophe caudatifolia sp. nov.

Herba erecta, ramosa, partibus junioribus plus minusve pubescentibus, foliis floralibus (bracteis) inaequimagnis, ad costa

margineque perspicue ciliatis, majoribus circiter 2 cm longis; foliis lanceolatis, membranaceis, tenuissime caudato-acuminatis, 10 ad 20 cm longis; floribus circiter 2.5 cm longis, corolla in ½ superiore parte leviter hirsuta.

An erect branched herb, the stems about 2 mm in diameter, pale, somewhat sulcate, glabrous, conspicuously constricted just above the nodes when dry, the younger branches somewhat pubescent. Leaves membranaceous, dark olivaceous, lanceolate, glabrous, or the upper surface with few, widely scattered, flaccid hairs, the cystoliths evident on both surfaces, 10 to 20 cm long, 1.5 to 3 cm wide, narrowed below to the cuneate base and above to the very slenderly caudate-acuminate apex, the acumen up to 3.5 cm long; lateral nerves about 9 on each side of the midrib, distinct. Inflorescences up to 8 cm long, the rachis and branches rather densely pubescent. Floral leaves unequal, prominently nerved, reticulate, conspicuously ciliate on the midrib and margins, the larger of each pair 2 cm long, 1 cm wide, elliptic to oblong-elliptic, acute, the smaller lanceolate, somewhat acuminate, 1.5 cm long, 5 mm wide. Flowers about 2.5 cm long, the bracts and bracteoles linear, long-acuminate, ciliate, about 12 mm long, 1 mm wide or less. Calyx lobes equal, linear, acuminate, ciliate, 7 mm long. Corolla tube very slender in the lower half, less than 1 mm in diameter, glabrous, then widened and more or less hirsute in the upper part, the lips subequal, about 9 mm long, the upper one entire, the lower one shortly 3-lobed, lobes oblong, obtuse, 1.5 mm long. Filaments and style glabrous; anthers 3 to 3.5 mm long, the cells two, obtuse, one higher than the other, overlapping for about half their length.

LUZON, Rizal Province, Montalban, *Loher 12196*, July, 1908.

The alliance of this very characteristic species is with *Peristrophe lancifolia* Merr. from which, among other characters, it is distinguished by its unusually slender caudate-acuminate leaves and its conspicuously ciliate floral leaves (bracts).

RUBIACEÆ

Genus **PAVETTA** Linnæus

Pavetta loheri sp. nov.

Frutex vel arbor parva, plus minusve pubescentibus; foliis lanceolatis, in siccitate nigricantibus, tenuiter subcaudato-acuminatis, basi cuneatis, subcoriaceis, 9 ad 15 cm longis, 2 ad 3.5 cm latis, supra glabris, nitidis, subtus pubescentibus, nervis utrinque circiter 6, adscendentibus, distinctis; floribus confertis, in-

florescentiis terminalibus, 3 ad 4 cm diametro, calycis dense hirsutis; corollae tubo leviter hirsuto, 7 mm longo, lobis anguste oblongis, obtusis, tubo aequantibus; ovario 2-loculare, loculis 1-ovulatis; stylis deorsum leviter hirsutis, exsertis, 2 cm longis; fructibus globosis, circiter 6 mm diametro, in siccitate pruinosis, seminibus binis, cupulatis.

A shrub or small tree, the branches somewhat reddish brown, terete, glabrous, the slender branchlets rather densely hirsute. Leaves lanceolate to narrowly oblong-lanceolate, 9 to 15 cm long, 2 to 3.5 cm wide, narrowed to the cuneate base and to the slenderly subcaudate-acuminate apex, subcoriaceous, the upper surface glabrous, shining, black when dry, the lower surface pubescent with scattered hairs arising from minute papillæ; lateral nerves about 6, ascending, distinct, curved-anastomosing; petioles hirsute, 5 to 10 mm long; stipules lanceolate, acuminate, appressed-hirsute, about 5 mm long. Inflorescences terminal, shortly peduncled, 3 to 4 cm in diameter, the 5-merous flowers crowded, the peduncles, branches, pedicels, bracts, and calyces densely hirsute. Bracts and bracteoles linear-lanceolate, the former up to 4 mm long, the latter half as long or less. Calyx tube 2 mm long, the lobes lanceolate, acuminate, half as long as the tube. Corolla white, black when dry, the tube 7 mm long, somewhat hirsute, the lobes about as long as the tube, narrowly oblong, obtuse, 2 mm wide, slightly hirsute on the back. Anthers lanceolate, 6 mm long. Ovary 2-celled, cells 1-ovulate. Style exserted, 2 cm long, slender, sparingly hirsute below. Fruits globose, glabrous, somewhat reticulate, pruinose when dry, about 6 mm in diameter. Seeds 2, hard, cupped.

LUZON, Rizal Province, Paningtingan, *Loher 12623, 13151* (type), *13212, 14211*, flowering in February and March, fruiting in October.

A strongly marked species, well characterized by its indumentum, its lanceolate, subcaudate-acuminate leaves, and its densely crowded flowers.

Genus **RANDIA** Houstoun

Randia loheri sp. nov.

Species *R. microcarpae* (Bartl.) Merr. affinis, differt foliis subtus in axillis haud glandulosis vel barbatis, inflorescentiis paucifloris, floribus plerumque binis, fructibus ellipsoideis.

An unarmed shrub or small tree, glabrous except the very slightly pubescent sepals, the branches and branchlets slender, terete. Leaves oblong-ovate to oblong-elliptic, chartaceous to

subcoriaceous, olivaceous, 6 to 11 cm long, 2.5 to 4.5 cm wide, smooth, dull, base acute, apex conspicuously acuminate, lateral nerves about 5 on each side of the midrib, distinct, not glandular or bearded in the axils beneath, obscurely curved-anastomosing, the reticulations obsolete or nearly so; petioles 5 to 10 mm long; stipules lanceolate from a broader base, 2 mm long. Inflorescences axillary, solitary, usually 2-flowered, the peduncles 1.5 to 2 cm long, the pedicels about 1 cm long with a pair of oblong-ovate, acuminate bracteoles near the base. Flowers white, black when dry. Calyx somewhat urceolate, the tube 5 mm long, glabrous or nearly so, the lobes lanceolate, slightly pubescent, 1.5 to 2 mm long. Corolla tube somewhat widened upward, 7 to 8 mm long, glabrous outside, the lobes elliptic-oblong, subacute to obtuse, about 7 mm long. Fruit ellipsoid, about 1.5 cm long, black when dry, glabrous, crowned by the cylindric remains of the upper part of the calyx tube.

LUZON, Rizal Province, Paningtingan and Montalban, *Loher 13161* (type) *12967*, flowering in March, fruiting in October.

The very evident alliances of this species are with *Randia microcarpa* (Bartl.) Merr., but there are notable differences in the vegetative, floral, and fruit characters as indicated in the diagnosis.

Genus UNCARIA Schreber

Uncaria luzoniensis sp. nov.

Species *U. acidae* Roxb. affinis, differt inflorescentiis exceptis glaberrima, foliis subcaudato-acuminatis, pedunculis brevioribus (ca. 1 cm longis), bracteis oblongis, haud concavis, floribus minoribus (corollae tubo vix 5 mm longo).

Scandent, entirely glabrous excepting the inflorescences. Branches and branchlets terete, smooth, subolivaceous. Leaves firmly chartaceous, brownish olivaceous, somewhat shining, elliptic-ovate, 7 to 8 cm long, about 4 cm wide, apex conspicuously subcaudate-acuminate, base acute; lateral nerves 3 on each side of the midrib, curved-ascending, obscurely anastomosing, reticulations obscure; petioles about 1 cm long; stipules caducous. Heads axillary, solitary, in anthesis about 2.5 cm in diameter, the peduncles 10 to 12 mm long, pubescent, jointed about 4 mm above the base and here supplied with a pair of oblong, obtuse, deciduous, flat bracts about 2.5 mm long. Flowers ebracteolate, sessile, ferruginous-pubescent with short hairs, the calyx somewhat urceolate, about 5 mm long, the broad obtuse lobes 0.5 mm long or less. Corolla tube pubescent, about 5 mm long, slender, the

lobes elliptic, pubescent on the back, about 1.8 mm long. Style glabrous, exserted, about 1 cm long.

LUZON, Rizal Province, Mabiluang, *Loher 14457*, October, 1913.

Genus WILLIAMSIA Merrill

Williamsia loheri sp. nov.

Frutex vel arbor parva, subglabra, ramis ramulisque teretibus, glabris, vel ramulis leviter compressis; foliis subcoriaceis, oblongis, pallide olivaceis, 7 ad 10 cm longis, tenuiter caudato-acuminatis, basi acutis ad rotundatis, utrinque ad costa nervisque parce ciliatis glabrescentibus, nervis utrinque 9 vel 10, valde perspicuis, curvato-adscendentibus; floribus axillaribus, solitariis vel fasciculatis, 6-meris, involucris leviter pilosis, inferioribus subquadratis, 2 mm diametro, interioribus majoribus, subcupulatis, 4 ad 7 mm diametro, 4-lobatis; calycis cupulatis, 5 mm diametro; petalis coriaceis, rigidis, extus glabratis, lanceolatis, acutis, 6 ad 7 mm longis.

A nearly glabrous shrub or small tree, the branches terete, brownish, the branchlets slender, terete or slightly compressed, about 1.5 mm in diameter, glabrous. Leaves subcoriaceous, oblong, slenderly caudate-acuminate, the acumen 1 to 2 cm long, base acute to rounded, pale olivaceous when dry, both surfaces sparingly ciliate on the midrib and lateral nerves, becoming glabrous or nearly so; lateral nerves 9 or 10 on each side of the midrib, very prominent on the lower surface, curved-ascending, the reticulations distinct; petioles about 1 cm long; stipules lanceolate, acuminate, glabrous, about 1.5 cm long. Flowers axillary, solitary or fascicled, sessile, the outer basal involucre slightly pubescent, subquadrate, 2 mm in diameter, irregularly lobed, the inner one larger, subcupulate, 4 to 7 mm in diameter, rather deeply 4-lobed, the lobes irregular, somewhat pubescent, ovate, obtuse, up to 2 mm long. Calyx coriaceous, cup-shaped, slightly pubescent, about 5 mm in diameter, shortly 4-lobed, the lobes unequal, two distinctly larger than the others. Corolla lobes 6, lanceolate, acute, rigid, coriaceous, glabrous externally, 6 to 7 mm long, the tube very short, throat densely bearded. Anthers lanceolate, 2 mm long.

LUZON, Rizal Province, Montalban, *Loher 12309*, October, 1909.

A species strongly characterized by its prominently nerved, slenderly caudate-acuminate leaves, in many respects resembling *Williamsia glabra* Merr., but not closely allied to that species.

Williamsia stenophylla sp. nov.

Frutex vel arbor parva, subglabra, ramulis tenuibus, 1 ad 1.5 mm diametro, glabris; foliis anguste lanceolatis, tenuissime caudato-acuminatis, chartaceis, pallidis, supra glabris, subtus leviter pubescentibus, 10 ad 13 cm longis, 1 ad 1.5 cm latis, nervis utrinque circiter 7, tenuibus, adscendentibus; fructibus ovoideis, glabris, circiter 1 cm longis, 6-locellatis.

A nearly glabrous shrub or small tree, the branches and branchlets slender, pale, terete, glabrous, the ultimate branchlets 1 to 1.5 mm in diameter. Leaves chartaceous, pale, narrowly lanceolate, 10 to 13 cm long, 1 to 1.5 cm wide, narrowed below to the acute base and above to the very slenderly caudate-acuminate apex, the acumen straight or somewhat falcate, 2 to 2.5 cm long, the upper surface glabrous, the lower surface sparingly appressed-pubescent on the midrib and lateral nerves; nerves about 7 on each side of the midrib, slender, distinct, ascending; petioles slender, 10 to 13 mm long; stipules linear-oblong, equaling the petioles. Flowers axillary, apparently solitary. Fruits sessile, ovoid, glabrous, about 1 cm long, 6-celled, crowned by the persistent calyx tube which is slightly pubescent, the lobes 4, oblong-ovate, obtuse, about 1.5 mm long. Basal involucres somewhat pubescent, the lower one subquadrate, about 2 mm in diameter, the inner one 6 mm in diameter, irregularly 4-lobed, the lobes orbicular to broadly ovate, rounded, 2.5 to 3.5 mm wide.

LUZON, Nueva Vizcaya Province, Caraballo Mountains, *Loher s. n.*, March, 1915.

A very characteristic species, at once recognizable by its narrowly lanceolate, slenderly caudate-acuminate, few-nerved leaves.

MAGELLANIA DICKERSONI, A NEW SPECIES OF BRACHIOPOD

By I. Hayasaka

Of the Institute of Geology and Paleontology, Tohoku Imperial University, Sendai, Japan

ONE PLATE AND ONE TEXT FIGURE

Magellania dickersoni sp. nov. Plate 1.

A peculiar form of *Magellania*. The shell is roughly pyramidal in outline, the dorsal valve forming the base of the pyramid. The ventral valve is divided into three parts, or lobes, the lateral ones almost perpendicularly deflected against the median one. The three lobes are nearly equal in width. The divergent ridges dividing the three lobes are not very distinct in the umbonal region, which is rather conical; the ridges, however, become more and more remarkable anteriorly, and give rise to very clear and quite sharply angular sinuses along the anterior commissure. The median part, or lobe, is very gently rounded in the front and makes a wide fold between these two angular sinuses. Lateral parts are nearly flat, but have a rounded margin, thus the ventral view of the brachiopod presents the appearance of an isosceles triangle with more or less strongly convex lateral sides. The umbonal region is more or less tumid, and the beak is somewhat pointed, truncated by a small round pedicle foramen. The pedicle foramen is complete, but the deltidium beneath it is not well preserved; it is probably composed of discrete plates. The beak does not quite hang over the opposite one.

The dorsal valve is almost regularly triangular in outline, with a rather obtuse top in the beak, and two down-pointed basal angles; the basal or the anterior angles of the dorsal valve are pointed so as to fix the two angular sinuses of the opposite valve described above. In the anterior view the anterior margin of the dorsal valve is naturally rather strongly folded up, and thus the general surface of the dorsal valve is flat.

The surface of the valves is generally smooth, but sometimes there are very faint concentric lines distinguishable under a magnifying glass. The shell is minutely and densely punctate; the punctures number about 50 to 60 or more in 5 square millimeters.

These characters have been observed in adult and typical forms of the species, which are about 25, 22, and 13 millimeters in length, width, and thickness, respectively. There are several smaller specimens that have the same characteristics.

In still younger forms the diverging ridges that divide the three lobes are not quite developed, although the particular gibbosity of the median portion is indicated in some of them. The dorsal valves are far less convex or, rather, nearly flat, and the ventral ones are strongly vaulted, in general.

It has been very difficult to examine the interior of the brachiopods. However, it is certain that the dorsal valve possesses a median septum inside, which reaches beyond the middle of the valve. In some of the specimens the existence of such a median septum is indicated by a dark line on the outer surface. In one of the specimens a peculiar loop, or at least a part of it, was detected. At the distal end of the median septum a small, funnel-shaped ring is attached; this ring is of a filament of variable width. The ring is somewhat elongate in the direction of the septum, and the diameter of its outer side is much larger than that of its proximal side. It is noteworthy that the direction of the ring is nearly perpendicular to the inner surface of the dorsal valve, or the direction of the septum itself.

Remarks.—It was with great hesitation that I determined this species, because the internal structure was not accessible to me until recently. However, the discovery of the ring-formed filament facilitated determination. This filament is found in the "Bouchardiform" and "Megerliniform" stages of some of the species of the genus *Magellania*, as schemed by Beecher;[1] these two stages were collectively called the "Pre-Magadiniform" stage by Thomson,[2] more recently. If the filament ring be only a part of the entire loop, this fossil cannot be much more advanced than the "Magadiniform" stage.[1]

The general outline of the fossils is of the type of *Magellania* (*Waldheimia*)[3] *septigera*[4] and *raphaelis*,[5] as shown by the pictures in Davidson's monograph of recent brachiopods. In both

[1] Studies in Evolution (1901) 286–309, pls. 13 and 14. A similar ring is also found in a younger specimen of *Waldheimia lenticularis* as shown by Douvillé, Bull. Soc. Geol. Fr. III 7 (1878–1879) 255, 256.

[2] Geol. Mag. 3 (1916) 497.

[3] *Waldheimia* is substituted by *Magellania* by Schuchert in Eastman's Text-Book of Paleontology (1913) 408.

[4] Monogr. Rec. Brach. p. 56, pl. 11, figs. 1–10.

[5] Op. cit. p. 58, pl. 11, figs. 11–13.

of these species the threefold division of the ventral valve is very well represented. Although in the first-named species the dorsal valve is much less convex than the ventral, the relative dimensions are different. In point of general outline, the last-named resembles the present fossil species much more closely, but the three folds are not developed in the same way as in *Magellania dickersoni.*

Davidson illustrates several stages of the loops of *Magellania septigera.* In the older stages, however, there is no ring making a part of the loop, whereas the ring is found in an adult specimen of the Philippine species.

It is very unfortunate that the literature in the Institute of Geology and Paleontology of Sendai on the Cenozoic and younger brachiopods is not very complete. I have been unable to find any fossil species much more closely allied to the present species than those Recent forms cited above. The literature on the South Pacific forms is especially important for the determination of the present fossil from the Philippines, as well as those from Japan, either fossil or Recent.

According to Thomson,[6] *Magellania* is one of the six genera that are restricted to the Australian Region. However, this genus seems to have been distributed somewhat more widely during the Tertiary period; for, as I have reported in a recent paper,[7] there are fossil forms of the genus in Japan. It is recorded that the genus *Magellania* existed in Miocene-Oligocene time in the Australian sea, while the forms allied to it are found in the Oligocene-Miocene faunas of Chile and the Antarctic. On the other hand, Thomson mentions as one of the characteristics of the Antarctic Recent fauna the presence of the genus *Magellania* s. s. which is restricted to the Miocene in Australia.[8] Further research seems to be necessary for a discussion of this kind; Cenozoic as well as Recent forms of brachiopods of Japan and the Philippines seem to be especially important.

[6] Australian Antarctic Expedition 1911–1914. Sci. Rep. ser. C. 4[3]: 40.
[7] Sci. Rep. Tohoku Imp. Univ. II 6 (1922) 155.
[8] Op. cit. p. 54, 55.

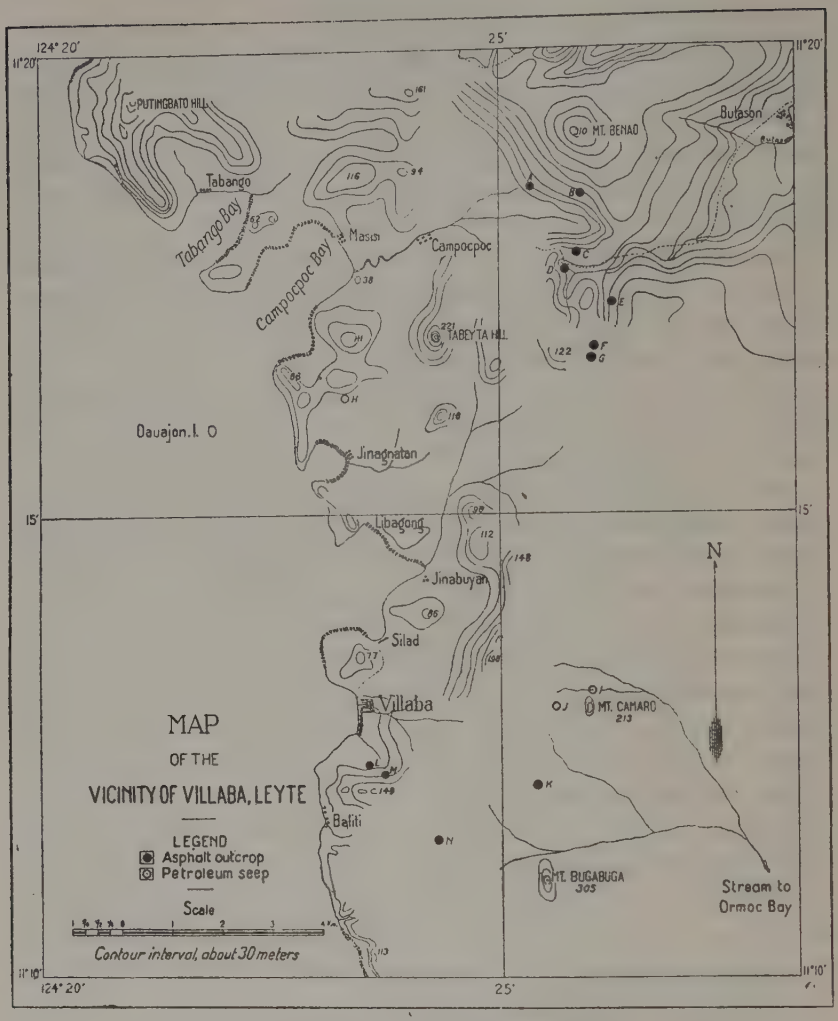


FIG. 1. Map of the Vicinity of Villaba, Leyte

Geologic age, Pliocene or Miocene.—Mr. Graham B. Moody assigns the tuffaceous sandstones, from which the fossil herein described was collected, to the Malumbang Pliocene, while Dr. Roy E. Dickerson regards them as being in the Canguinsa formation of the Vigo (Miocene) group. The type locality of *Magellania dickersoni* is described as follows:

Dickerson's locality 18, Philippine Islands, Leyte Island, west coast, east of north end of Cebu, 3.5 kilometers north of Villaba and 1 kilometer northwest of Libagong barrio, in sea cliff, brown tuff which dips 22° south and has a strike of north 57° west. January 16, 1920. Roy E. Dickerson, collector.

208379——5

ILLUSTRATIONS

PLATE 1. MAGELLANIA DICKERSONI SP. NOV.

FIG. 1. Type specimen, × $\frac{4}{3}$; *a*, dorsal view; *b*, ventral view; *c*, lateral view.
2. A cotype, × $\frac{4}{3}$; *a*, dorsal view; *b*, ventral view; *c*, lateral view.
3. Another cotype; *a*, dorsal view; *b*, ventral view; *c*, lateral view.
4. View of shell showing its pectinate character, about × 6.
5. Sketch showing the character of the loop, × 4.5.

TEXT FIGURE

FIG. 1. Map of the vicinity of Villaba, Leyte.

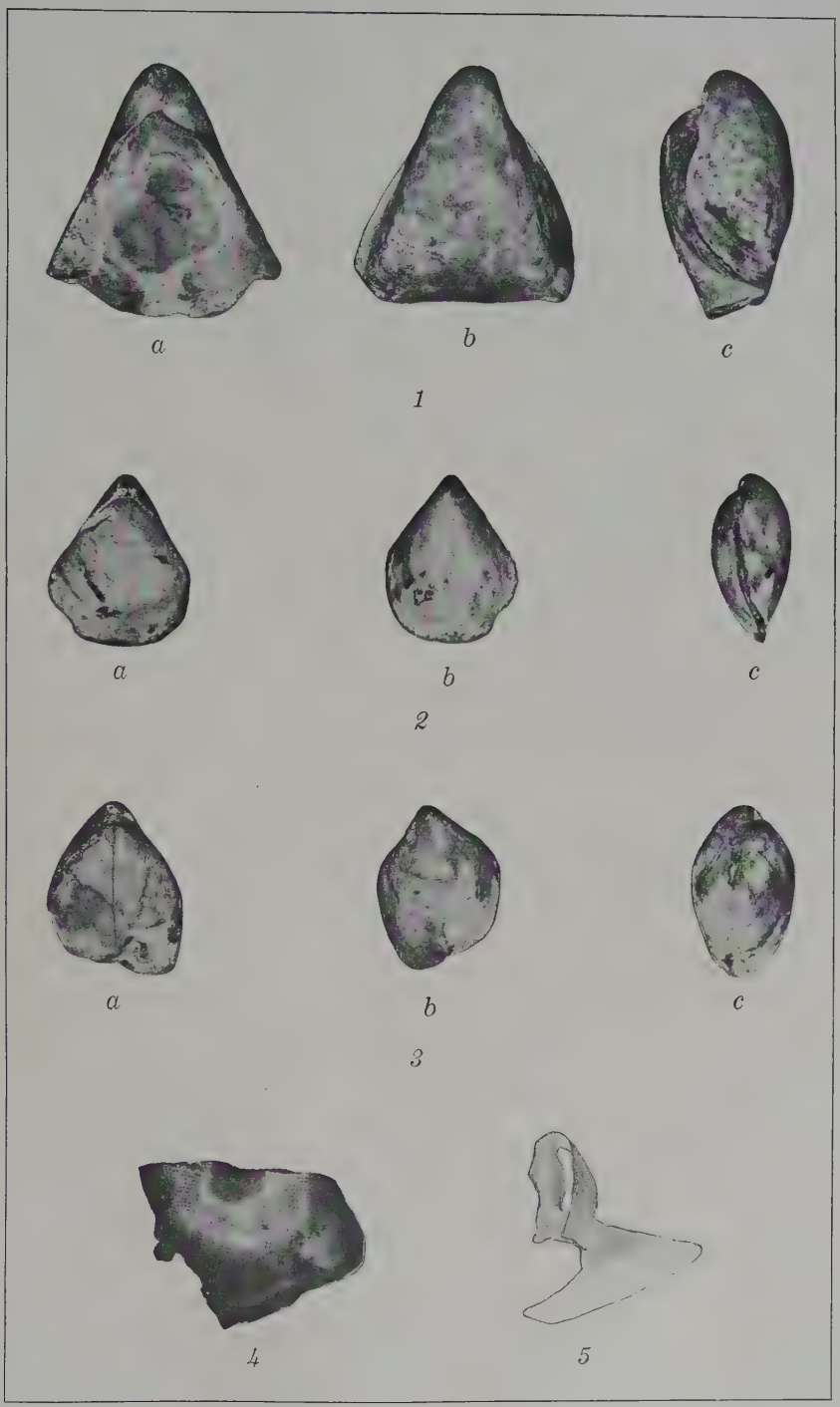


PLATE 1.

NEW PHILIPPINE CETONIIDÆ

By J. Moser

Ellrich im Harz, Germany

Euglypta bakeri sp. nov.

♂. Nigra, opaca, albo-signata. Capite fortiter punctato, fronte strigillata, biimpressa, clypeo margine antico profunde emarginato, prothorace postice parum latiore quam longiore, antrorsum attenuato, lateribus leviter bisinuatis, basi ante scutellum paulo sinuata, dorso utrinque vitta longitudinali alba postice abbreviata, ornato; scutello nigro; elytris basi prothorace latioribus, postice attenuatis, lateribus post humeros sinuatis, sutura postice elevata, apice spinoso; elytris singulis fascia transversa antemedia, macula laterali postmedia maculaque oblonga apicali albis; pygidio aciculato-punctato, vitta media longitudinali alba. Subtus medio nigro nitido, lateribus albis; processu mesosternali paulo convexo; tibiis anticis tridentatis, tibiis posticis intus nigro-ciliatis. Long. 17 mm.

Negros, Occidental Negros, Cuernos Mountains (*C. F. Baker* leg.).

Glycyphana rubroscutellaris Mohn. var. nigroscutellaris var. nov.

A forma typica differt: scutello nigro.

Mindanao, Lanao Province, Mumungan. Leyte, Santa Cruz (*G. Boettcher* leg.).

Glycyphana rubroscutellaris Mohn. var. immarginicollis var. nov.

A forma typica differt: scutello nigro, prothorace haud rubromarginato.

Negros, Occidental Negros, Cuernos Mountains (*Baker* leg.).

Glycyphana aethiessida White var. immaculata var. nov.

A forma typica differt: prothorace elytrisque nigris, haud flavo-maculatis.

Panay (northwestern part) (*Baker* leg.).

NEW OR LITTLE-KNOWN TIPULIDÆ FROM THE PHILIPPINES (DIPTERA), PART II [1]

By CHARLES P. ALEXANDER

Of Amherst, Massachusetts

Through the kindness of Prof. Charles Fuller Baker and Mr. Richard C. McGregor, I have now seen a number of additional species of Philippine crane flies; the undescribed forms are described herein. All of the specimens were taken in Luzon with the exception of a magnificent *Pselliophora* from Sibuyan. Except where stated to the contrary, the types are retained in my collection, through the great kindness of the collectors.

LIMNOBIINÆ

Geranomyia (Geranomyia) cornigera Alexander.

Geranomyia cornigera ALEXANDER, Insec. Inscit. Menst. 1 (1913) 137 to 139.

A male specimen from Manila, January 12, 1922 (*McGregor*). The species was described from material taken at Pettit Barracks, Philippines, October 22–23, 1912, and had not been found again until the present record.

Dicranomyia (Alexandriaria) brevissima sp. nov.

Genera[1] coloration yellow, the prescutum, scutal lobes, and parts of the postnotum shiny black; wings faintly tinged with brown, clearer before and beyond the darker brown stigma; Rs transverse, very short, crossing the proximal end of the stigma.

Female.—Length, about 3 millimeters; wing, 4.1.

Rostrum yellow, the palpi dark brown. Antennæ with the scapal segments testaceous; flagellar segments pale brown, the basal segments short-oval, thence passing into elongate-oval. Head yellow; vertex between the eyes very narrow.

Pronotum yellow. Mesonotal prescutum shiny black, the humeral triangles light yellow; scutum black, the median area

[1] For Part I see Philip. Journ. Sci. 21 (1922) 373–384.

brown; scutellum brown; postnotal mediotergite brown, the lateral margins black; pleurotergite black. Pleura light yellow. Halteres broken. Legs with the coxæ and trochanters pale yellow; remainder of the legs broken. Wings with a faint brown tinge, extensively clearer before and beyond the stigma which is dark brown, short-oval; veins brown. Venation: Sc short, the distance between the tip of Sc_1 and origin of Rs approximately three times the length of Rs; Sc_2 some distance from the tip of Sc_1; Rs very short, perfectly transverse, and in alignment with the transverse basal third of the deflection of R_{4+5}; at the juncture of these veins, a long spur juts proximad into cell R; Rs thus crosses the extreme proximal end of the stigma and r its distal end, cell 1st R_1 being entirely included in the stigma; basal deflection of R_{4+5} angulated and feebly spurred at one-third its length; basal deflection of Cu_1 approximately at the fork of M.

Abdomen dark brown, the shields of the ovipositor black; sternites obscure yellow, clearer basally.

LUZON, Mount Maquiling (*Baker*); type, female.

Type returned to Professor Baker.

Lechria philippinensis sp. nov.

General coloration shiny yellow; wings subhyaline, the costal region distinctly infuscated; cell 1st M_2 very long and narrow; vein 2d A short, the cell narrow.

Male.—Length, about 5.8 millimeters; wing, 6.8 to 7.

Rostrum obscure yellow, the palpi brownish black. Antennæ black throughout, of moderate length only. Head dark gray, the anterior triangle slightly more silvery.

Pronotum obscure yellow, darker medially. Mesonotum shiny fulvous yellow, the disk of the scutellum and the center of the mediotergite more infuscated. Pleura shiny fulvous, without pruinosity. Halteres yellow, the knobs brown. Legs with the coxæ yellow; trochanters yellow, the mesal face at apex with a black spot; femora pale brownish testaceous, the tips indistinctly darkened; tibiæ and tarsi darker brown. Wings subhyaline; cells C, Sc, Sc_1 and the stigma distinctly infuscated; veins brownish black. Venation: r-m only a little less than its own length before the fork of Rs; basal section of R_2 only a little shorter than m-cu; cell 1st M_2 elongate, r-m beyond midlength, m-cu slightly before midlength; basal section of M_3 about equal to or longer than the distal section of R_2; vein 2d A short, cell 2d A being very narrow.

Abdomen obscure brownish yellow, the incisures of the segments blackened; subterminal segments darkened to form an ill-defined ring; sternites obscure yellow, the basal lateral angles of the segments darkened; hypopygium yellowish.

LUZON, Manila, April, 1923 (*McGregor*); type, male; paratype, male.

According to my key to the species of *Lechria*,[2] the present species would run to *L. bengalensis* Brunetti, from which it differs in the diagnostic characters outlined above.

Eriocera cinereithorax sp. nov.

Head and thorax grayish pruinose; antennal flagellum brownish yellow, the terminal segment brownish black; femora obscure yellow, the tips blackened; wings dark brown, the base of cells C and Sc yellow; a pale yellow crossband before the cord; basal half of cell 1st A yellow; abdominal segments 1 and 6 to 8 black, the intermediate segments orange-yellow with a narrow black lateral line.

Male.—Length, 11 to 12 millimeters; wing, 10.5 to 12.5.

Female.—Length, 15 millimeters; wing, 12.

Rostrum black, pruinose; palpi black. Antennæ rather short, the basal segment dark brown, pruinose; second segment a little paler; flagellar segments brownish yellow, the last segment abruptly brownish black; flagellar segments gradually decreasing in length to the last. Head light gray, the sides of the vertex behind a little darker.

Mesonotal prescutum gray with four ill-defined dark brown stripes, the lateral margin of the sclerite likewise darkened; scutum, scutellum, and postnotum black, less heavily dusted with gray. Pleura black, sparsely and irregularly dusted with ashy gray. Halteres black, the extreme base of the stem a little paler in some specimens. Legs with the coxæ and trochanters black; femora obscure yellow, the tips rather narrowly blackened; tibiæ brown, the tips blackened; tarsi black. Wings dark brown, the prehumeral cell and basal two-thirds of cells C and Sc bright yellow; a conspicuous paler yellow crossband before the cord, lying in cells 1st R_1, R, and M; about the basal half of cell 1st A of the same color; veins black, obscure yellow in the flavous areas. Venation: Sc_1 ending beyond the origin of R_2, Sc_2 opposite two-thirds the length of R_{2+3}; r on R_1 nearly four times its length from the tip and on R_2 a little more than

[2] Proc. Roy. Soc. Queensland 32 (1920) 102 and 103.

twice its length beyond the fork; R_{2+3} about equal to terminal section of R_1; cell M_1 present but very small in the allotype; basal deflection of Cu_1 a little less than its length beyond the fork of M.

Abdomen with the basal segment black; segments 2 to 5 orange-yellow, the lateral line narrowly blackened; caudal margin of segment 5 and all of segments 6 to 8 black; hypopygium yellowish brown, especially the basistyles. In the female, the basal shields of the long ovipositor are reddish.

LUZON, Ilocos Norte Province, Solsona, December, 1923 (*McGregor*); type, male; paratype, male; Piddig, November, 1923 (*McGregor*); allotype, female.

Erioptera (Baeoura) semicincta sp. nov.

General coloration blue-gray; scutum pale yellow; wings grayish subhyaline, with a very broad but ill-defined and indistinct darker band at the level of the cord.

Male.—Length, about 3 millimeters; wing, 3.3.

Rostrum and palpi brown. Antennæ black throughout, the verticils conspicuous. Head broad, clear blue-gray.

Pronotum, mesonotum, and pleura dark, blue-gray pruinose, the prescutum with three confluent darker stripes, the scutal lobes slightly darkened; scutellum broad, pale yellow, the extreme base at the middle with a dark spot. Halteres short, dark brown. Legs with the coxæ yellowish testaceous; femora brownish yellow, the tips broadly dark brown; remainder of legs dark brown. Wings grayish subhyaline, with a very broad, indistinct, ill-delimited darker band crossing the wing at the level of the cord; veins black. Venation: Sc_1 ending about opposite midlength of R_{2+3}; r about its length beyond the fork of R_{2+3}; basal deflection of Cu_1 a little more than one-half its length beyond the fork of M; petiole of cell M_3 a little longer than the basal deflection of Cu_1; arculus oblique.

Abdomen dark brown, the intermediate sternites a trifle paler.

LUZON, Ilocos Norte Province, Solsona, December, 1923 (*McGregor*); type, male.

Teucholabis quinquemaculata sp. nov.

General coloration yellow, the prescutum and scutum with five shiny black markings; wings subhyaline, with the apex and a narrow brown seam along the cord pale brown; Sc_1 ending beyond midlength of Rs, Sc_2 shortly beyond the origin of Rs; cell 1st M_2 closed.

Male.—Length, 5 millimeters; wing, 6.

Rostrum slender, about as long as the head, black; palpi black. Antennæ with the scapal segments obscure brownish yellow; flagellar segments oval, dark brown. Head shiny black above, the anterior part of the vertex and the front silvery pubescent; genæ and postgenæ shiny brownish yellow.

Cervical sclerites slender. Pronotum shiny yellow, margined around by black. Mesonotal prescutum and scutum shiny yellow with five conspicuous shiny black areas, the three on the prescutum representing the usual stripes, the lateral ones transversely subcircular and only narrowly separated from one another by a rufous median line; median spot restricted to the cephalic margin of the sclerite; scutal marks occupying the centers of the lobes; scutellum yellow, the caudomedial region black; postnotum black. Pleura black, the sternopleurites and meron yellow, the ventral region of the anepisternum with appressed microscopic gray pubescence. Halteres with the stems black, the extreme bases paler, the knobs broken. Legs with the coxæ yellow, the fore coxæ shiny dark brown; trochanters yellow; remainder of legs broken. Wings subhyaline, the apex faintly darkened; a relatively narrow pale brown band across the wing at the level of the cord, the cephalic end (stigma) darker; veins brown. Venation: Sc_1 ending beyond midlength of Rs, Sc_1 far from its tip and lying only a short distance beyond the origin of Rs, the latter feebly sinuous; r less than its length from the tip of R_1 and approximately the same distance from the fork of Rs; cell 2d R_1 at wing margin very broad; veins R_{2+3} and R_{4+5} running generally parallel; cell 1st M_2 closed, gently widened distally; basal deflection of Cu_1 about its own length beyond the fork of M; vein 2d A bent rather strongly to anal margin at its tip.

Abdominal tergites black, the basal sternites brown, the terminal sternites variegated with yellow; sixth sternite with a median hairy organ as in the group; hypopygium black.

LUZON, Mount Maquiling (*Baker*); type, male.

Type returned to Professor Baker.

Teucholabis confluenta sp. nov.

General coloration shiny black; pronotum and scutum orange-yellow; knobs of halteres orange; wings whitish subhyaline, with three brown crossbands, the outer one apical and including more than the distal sixth of the wing; cell 1st M_2 open by the atrophy of the outer deflection of M_3.

Male.—Length, 5.6 to 5.8 millimeters; wing, 6.

Rostrum elongate, shiny black, about as long as the head; palpi black. Antennæ with the basal segment of the scape brownish black, the remainder of the organ paler brown; flagellar segments oval, the outer segments becoming more elongated. Head black, slightly pruinose, especially anteriorly.

Pronotum orange-yellow, the elongate cervix black. Mesonotal prescutum uniform shiny black, the scutum uniform orange-yellow; scutellum, parascutella, and postnotum black. Pleura shiny black, the propleura orange. Halteres black, the knobs conspicuously orange. Legs with the coxæ and trochanters obscure orange; remainder of the legs broken. Wings whitish subhyaline, with three brown crossbands, including the broad dark apex that includes more than the distal sixth of the entire wing; a broad, nearly uniformly wide band along the cord, a little darker at the stigma, along the caudal margin of the wing connected narrowly with the apical band; a narrower band at the level of the origin of Rs and tip of vein 2d A, a very little widened at vein Cu; veins dark brown. Venation: Sc_1 ending just before midlength of Rs, Sc_2 shortly before this origin; r a little more than its length from the tip of R_1 and a short distance beyond the fork of Rs; cell 1st M_2 open by the atrophy of the outer deflection of M_3; basal deflection of Cu_1 a little less than one-half its length beyond the fork of M.

Abdomen shiny blue-black throughout, including the hypopygium.

LUZON, Mount Maquiling (*Baker*); holotype, male; paratypes, two males.

Styringomyia flavocostalis sp. nov.

General coloration yellow, the anterior part of the mesonotal prescutum, the lateral margins of the scutal lobes, and the postnotum black; wings tinged with pale brown, variegated with darker brown, the costal margin conspicuously light yellow; r-m lying proximad of R_{2+3}.

Male.—Length, 5.5 millimeters; wing, 3.5.

Rostrum and palpi brown. Antennæ with the basal segments dark brown, paler dorsally; flagellum broken. Head brown, light gray pruinose.

Pronotum and anterior part of mesonotal prescutum dark brown, silvery pruinose, especially in front, the posterior half of the prescutum and anterior half of the scutum obscure yellow; scutal lobes variegated posteriorly and laterally with

brown; scutellum black, broadly yellowish medially at base; postnotum black. Pleura yellow. Halteres pale, the knobs slightly infuscated. Legs with the coxæ and trochanters yellow; femora and tibiæ yellow, each with narrow dark brown rings, the femoral rings premedial and postmedial, the tibial rings premedial and apical; tarsi pale, darkening at tips. Wings faintly tinged with brown, the costal margin conspicuously bright yellow; brown clouds along the cord and outer end of cell 1st M_2, along vein Cu, and at tip of vein 2d A; veins pale brown, darker in the infuscated areas, the costa bright yellow. Venation: R_{2+3} a short distance beyond r-m, which thus connects with the end of Rs; vein 2d A very strongly bent at tip but not spurred.

Abdomen dark brown, the sternites more testaceous; hypopygium yellow. Male hypopygium with the basistyle terminating in a single long spine.

LUZON, Mount Maquiling (*Baker*); holotype, male; paratype, male.

By Edwards' key to the species of *Styringomyia*, the present form runs out at *S. marshalli* Edwards (Mashonaland), a very different fly.

TIPULINÆ

Pselliophora bakeri sp. nov.

General coloration orange-yellow; conspicuously variegated with black; all tibiæ with subbasal white rings; wings black; a conspicuous ⊣-shaped pale yellow mark in the basal cells; basal half of cell 2d A pale yellow; abdomen cross-banded with black.

Female.—Length, about 16 millimeters; wing, 14.8.

Frontal prolongation of head, including the short nasus, yellow; first segment of palpus pale; segments 2 and 3 dark brown, the ends pale, the elongate terminal segment yellow, the distal fourth dark brown. Antennæ 12-segmented; scape yellow; flagellum dark brown. Head yellow; a narrow transverse dark brown line across the vertex immediately behind the antennal bases, very narrowly interrupted by an orange spot at the summit of the vertical tubercle; a conspicuous brown semicircular occipital mark.

Pronotum orange-yellow, conspicuously blackened laterally. Mesonotum orange-yellow, with a handsome black pattern, distributed as follows: Prescutum with three stripes, the lateral stripes very short and lying close to the long medial vitta; scutal

lobes each with two marks, a small spot on the anterolateral portion and a much larger mark on the posteromesal portion, the latter with the caudal ends confluent across the median line; scutellum black; postnotum with the median sclerite yellow, the posterior portion largely covered by a black triangle, the point of which is directed cephalad; postnotal pleurotergites black with a small yellow area on the dorsomesal margin of each. Pleura orange-yellow, with a conspicuous black area surrounding the wing root, beginning immediately cephalad of this root on the mesepisternum, crossing the epimeron; halteres surrounded by black; sternopleurite narrowly blackened ventrally. Halteres yellow, the knobs conspicuously dark brown. Legs with the coxæ black, the midcoxæ very indistinctly spotted with obscure yellow; trochanters yellow; femora black, the bases narrowly yellow; tibiæ black, each with a narrow but conspicuous snowy white ring immediately beyond the base, these rings of approximately equal extent on all the legs; tarsi black. Wings black, the extreme base yellow; a conspicuous pale yellow, —|-shaped mark occupying the disk, the stem lying in parts of both cells R and M for their entire length, the crossbar lying before the cord in cells 1st R_1, the basal half of 1st M_2, and the bases of cells M_3 and Cu_1; basal half of cell 2d A similarly pale yellow; base of cell 1st A and caudal half of Cu grayish; veins black, yellow in the flavous areas. Venation: r-m very short; cell M_1 rather narrowly sessile; m-cu short but distinct.

Abdomen orange, conspicuously cross-banded with black; tergite 1 black; a broad band beyond midlength of tergite 2, subbasal bands on tergites 3 to 8, these becoming broader and more conspicuous on the outer segments, wider at the lateral margins than on the disk. Ovipositor deep horn color, the bases black.

SIBUYAN (*Baker*); type, female.

This beautiful *Pselliophora* is named in honor of Prof. C. F. Baker, to whom I am indebted for many favors in the past.

Pselliophora mcgregori sp. nov.

Male.—Length, 11.5 to 12 millimeters; wing, 12.

Female.—Length, 17 millimeters; wing, 14.5.

Generally similar to *P. idalia* (Osten-Sacken).

Frontal prolongation of head with a short nasus. Median area of pronotum yellow. Mesonotum velvety black, the usual stripes confluent, the humeral region and broad lateral margins broadly pale yellow; postnotal mediotergite black with a trans-

verse yellow band before the base. A conspicuous yellow spot on the meron. Halteres dark brown, the base of the stem yellow. Legs black, only the extreme bases of the fore femora a trifle paler; all tibiæ with a snowy white ring immediately beyond the base. Wings with the ground color black; cell 2d A pale; in the female, cells R, M, and 1st A with pale linear streaks; extreme base of wing pale. Cell M_1 sessile (male) or short-petiolate (female). Abdomen black; segment 2 with more than the basal half pale yellow; tergites 2 to 5 and sternites 3 to 8 with the caudal margins of the segments conspicuously and broadly banded with yellow; on sternite 8 the yellow color includes more than the apical half of the conspicuously projecting median lobe. Hypopygium elongate-cylindrical, tilted at an angle to the remainder of the abdomen. In the female, the yellow abdominal markings include, besides the marks on segment 2, narrow rings on tergites 3 and 4 and on sternites 2 to 7, becoming smaller and subobsolete outwardly.

LUZON, Ilocos Norte Province, Bangui, November, 1923 (*McGregor*); holotype, male; allotype, female; paratype, male.

This handsome crane fly is dedicated to Mr. Richard C. McGregor, as an appreciation of his valuable coöperation in making known the very interesting tipulid fauna of the Philippines.

Tipulodina luzonica sp. nov.

Antennæ of male relatively long; median prescutal stripe conspicuous; fore femora with a pale subterminal ring; fore and middle tibiæ with a snowy white subterminal ring; posterior tibiæ with a subbasal and a subterminal white ring; basitarsi black, only the narrow tips white; wings clear, the center of the cord not or scarcely seamed with darker; no brown cloud near midlength of cell M; spinous dististyle of male hypopygium small and inconspicuous.

Male.—Length, 14 to 15 millimeters; wing, 14 to 15.

Female.—Length, 18 to 19 millimeters; wing, 14.

Frontal prolongation of head pale above, the sides dark brown; nasus very long and slender, pale. Antennæ of male elongate, if bent backward extending to beyond the base of the abdomen; basal segment testaceous, the tip dark brown; second segment brownish testaceous; flagellum black, the incisures of the segments indistinctly whitish. Head dark brownish gray, the anterior part of vertex and the genæ pale whitish ocherous, the vertex with a dusky area on either side behind the eyes.

Pronotum broadly dark brown medially, the sides buffy yellow. Mesonotal prescutum yellow, especially the humeral region, with a very broad and conspicuous dark brown stripe that is further divided by a capillary darker brown vitta; lateral stripes small and relatively ill defined; scutal lobes obscure yellow, each with two large, dark brown areas; scutellum brownish gray, the parascutella brown; postnotum dark gray. Pleura pale yellow, with a sparse silvery white bloom; postnotal pleurotergite with an oval, silvery area that is bordered, except dorsally, by a conspicuous brown mark immediately before the halteres; a small brown spot immediately ventrad of the metaspiracle. Halteres dark brown, the base of the stem narrowly yellow. Legs with the coxæ pale, whitish pruinose, the posterior coxæ with a small apical brown spot on caudal face; trochanters testaceous yellow, with a brown spot on mesal face of each; fore femora brownish testaceous, brighter basally, with a conspicuous yellowish white ring before the narrower black tip; midfemora bright brown, the tips narrowly blackened; posterior femora brownish testaceous, the tips broadly and conspicuously blackened; fore and middle tibiæ black with a broad, snowy white ring before the slightly broader black apex; posterior tibiæ with a similar white ring and an additional narrower subbasal white ring; basitarsi black, the apex of each narrowly white; remainder of tarsi snowy white, excepting the infuscated terminal segment. Wings clear whitish hyaline, highly iridescent; cell Sc brownish black; stigma oval, dark brown, sending a seam along the anterior cord; Cu, Cu_2, and basal deflection of Cu_1 narrowly bordered with brown; wing apex brown, including the apex of cell R_2; the distal two-fifths of R_3 (the latter inclosing a small subhyaline droplet); about the same extent of cell R_5; veins M_1 and M_2 seamed with brown, especially the former, the center of cell M_1 remaining broadly pale; veins slender, brownish black, very distinct. Venation: Basal deflection of R_{4+5} distinct, nearly as long as r-m; cell 1st M_2 large, the fusion of M_3 and Cu_1 equal to or greater than the basal section of M_3 alone; m and petiole of cell M_1 subequal, the latter cell very short and broad; vein 2d A very short, cell 2d A being thus unusually narrow. In the females, the cord and vein M_{1+2} are narrowly seamed with brown.

Abdominal tergites bright brown, the lateral margins narrowly, the subcaudal region of the segments rather broadly, blackened; caudal margins of the segments narrowly yellowish; base of tergite 3, and more narrowly on the succeeding tergites,

glabrous, brownish gray; the shorter subterminal tergites are largely black with the bases, lateral margins, and basal lateral angles obscure yellow, more or less pruinose; basal sternites obscure yellow, the subterminal segments gray; hypopygium and eighth sternite yellow to ocherous fulvous. Male hypopygium small, the tergal region very narrow; chitinized hooks of the dististyle small and relatively insignificant, directed dorsad, the acute black tips cephalad.

LUZON, Manila, August, 1923 (*McGregor*); holotype, male; allotype, female; and fourteen paratype males and females.

This handsome fly belongs to the group of the genus with elongate antennæ in the male sex; with no dark spot near midlength of cell M of the wings; and with the male hypopygium small and without conspicuous appendages. This is undoubtedly the same fly that was referred to *T. pedata* (Wiedemann) by Osten-Sacken,[3] but is certainly not the true *pedata*. It may likewise be the species referred by Bezzi [4] to *Tipulodina cinctipes* (de Meijere), described from Borneo; the latter species is very distinct in the coloration of the basitarsi. The genus is a very characteristic one in the Oriental fauna but is rather difficult to differentiate from *Tipula* on characters of the adult flies. The pupæ differ widely from species of *Tipula*, however, and there is but little doubt of the generic validity of the group. All of the species known pertain to the Ethiopian and Oriental faunæ, although two, *Tipulodina joana* (Alexander) and *T. nipponica* (Alexander), occur in the lower regions of Japan as far north as Tokyo.

[3] Berl. Ent. Zeitschr. 26 (1882) 92.

[4] Philip. Journ. Sci. § D 12 (1917) 111 and 112.

A SECOND LOT OF PARASITIC HYMENOPTERA FROM THE PHILIPPINES

By A. B. Gahan

Of the United States Department of Agriculture, Bureau of Entomology, Washington

ONE PLATE

This paper contains descriptions of seventeen new species and one new genus, as well as notes on several previously described parasitic Hymenoptera, and includes representatives of the three great superfamilies Ichneumonoidea, Chalcidoidea, and Serphoidea. The greater part of the material treated was received from Charles Fuller Baker, dean of the College of Agriculture, University of the Philippines. Three species of Serphoidea were sent by Anastasio A. Rowan, a student at the same university. More or less definite host records are given for most of the species on the authority of the collectors.

ICHNEUMONOIDEA

BRACONIDÆ

SPATHIINÆ

Genus **SPATHIUS** Nees

In the new species described below, as well as in *S. philippinensis* Ashmead, the type of which has been examined, the median cell of forewing (Plate 1, fig. 2) is broad basally, very much narrowed beyond the middle, and of normal width at apex; the median nervure is strongly curved caudad at or a little beyond the middle, almost touching the submedian nervure with which it runs nearly parallel for some distance and then curves forward again to meet the basal nervure. In *Spathius exarator* Linnæus, type of the genus, as well as in all of the other species known to me, the median nervure is practically straight or only slightly curved.

The three species thus far known from the Philippines can be separated as follows:

Key to species of Spathius from the Philippines.

1. Median nervure straight, the median cell not narrowed beyond the middle; propodeum with a complete and distinct areola; wings uniformly smoky; face transversely wrinkled..... **S. fuscipennis** Ashmead.
   Median nervure strongly curved, the median cell beyond the middle very much narrowed; propodeum without areolation; wings fuscous, contrastingly marked with hyaline spots or bands..... 2.
2. Face transversely wrinkled; vertex finely transversely striated; first transverse cubitus and the second abscissa of radius forming a straight line; first tergite not broader at apex than at base; second tergite very faintly longitudinally aciculated, almost smooth; suturiform articulation absent; temples narrower than the eyes.
   S. philippinensis Ashmead.
   Face not transversely wrinkled, but granularly punctate or coriaceous; vertex weakly reticulated and shining, without any transverse striæ; first transverse cubitus forming a distinct angle with second abscissa of radius; first tergite distinctly broader at apex than at base; first, second, greater part of third, and base of fourth tergite distinctly and uniformly coriaceously punctate; suturiform articulation present and very finely striated; temples broader than the eyes.
   S. dinoderi sp nov.

Spathius dinoderi sp. nov. Plate 1, fig. 2.

Male.—Length, 3.2 millimeters. Head quadrate; face, including clypeus, uniformly granularly punctate, opaque; frons, vertex, temples, and cheeks weakly reticulated and shining; eyes small, elliptical, not quite as broad as temples; ocelli small, the postocellar line a little shorter than ocellocular line; antennæ very slender, as long as the body, 25-jointed in the type; mesoscutum weakly reticulated, somewhat shining, the posterior middle without longitudinal rugæ and the parapsidal grooves without foveæ; scutellum sculptured like mesoscutum, the transverse furrow at base weakly foveolated; propodeum as long as mesoscutum, nearly horizontal, uniformly reticulate-punctate, and opaque, without transverse or longitudinal carinæ; mesopleura and metapleura weakly sculptured and shining; median nervure strongly curved, the median cell greatly narrowed beyond the middle; second abscissa of radius slightly longer than first intercubitus and forming an angle with it; recurrent nervure joining second cubital near the intercubitus; subdiscoideus interstitial; submediellan cell of hind wing small and narrow, the costal cell rather broad at apex; hind femora distinctly swollen and much shorter than their tibiæ, median and front femora also slightly

thickened; abdomen as long as head and thorax, the petiole a little broader at apex than at base, about half the length of remainder of abdomen; petiole above, second and third tergites (except apical border of the latter) and base of fourth tergite sculptured like the propodeum; remainder of abdomen nearly smooth with only very faint reticulation.

Head testaceous; antennæ pale testaceous with apex brownish; thorax, legs, and abdomen dark brownish testaceous, the mesonotum posteriorly, propodeum entirely, and the abdomen apically, more or less piceous; forewings strongly infuscated, with narrow base, transverse band at middle of costal nervure, a spot embracing base of stigma, a spot in radial cell behind apex of stigma, a spot surrounding the recurrent nervure, and a broad apical band hyaline; venation dark brown, the base of stigma pale; hind wings hyaline.

Female unknown.

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26758, United States National Museum.

Host.—*Dinoderus minutus* Fabricius.

Described from two males received from C. F. Baker under his Nos. 18618 and 18619, and said to have been reared from the above-mentioned host infesting bamboo. The male paratype is much smaller and lighter colored than the type but otherwise appears to be the same.

MICROGASTERINÆ

Apanteles angustibasis sp. nov.

Female.—Length, 1.75 millimeters. Head, as viewed from in front, a little broader than high, more convex above than below, the vertex strongly arched above the eyes while the ventral margin of head is nearly straight; cheeks short and not at all convex; vertex, frons, and temples smooth and impunctate; face shining but with very minute obscure punctures; antennæ short, about two-thirds as long as the body, the first flagellar joint about twice as long as broad, following joints shorter, those beyond the fifth subquadrate; mesoscutum somewhat shining, with suberased punctures, the punctures more distinct and more numerous anteriorly; scutellum impunctate; propodeum rugulose, subopaque, with a poorly defined areola and weak costulæ, the areola mostly effaced anteriorly; pleura shining and sparsely punctate; first radial abscissa not quite perpendicular to the

front margin of wing, straight, arising at middle of stigma, joining first intercubitus at a distinct angle and distinctly longer than the intercubitus; abdomen as long as the thorax, flattened dorsally and not compressed, perfectly smooth and polished; first segment fully three times as long as broad, very narrow, and as broad at base as at apex, the sides parallel; ovipositor sheaths approximately one-third as long as abdomen, moderately slender and distinctly curved downward. Hind tibial spurs unequal, the inner and longest spur less than half as long as the metatarsus.

Black; antennal flagellum dark brownish testaceous; palpi yellowish; front and middle tibiæ and tarsi, posterior trochanters, basal half of hind tibiæ, and apices of hind tarsi testaceous; all coxæ black; all femora, apical half of hind tibiæ, and hind tarsi basally brownish black; membranous margins of first tergite more or less testaceous; ovipositor sheaths black; wings hyaline, the stigma uniformly pale brownish, veins paler than the stigma.

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26759, United States National Museum.

Host.—*Cnaphalocrocis medinalis* Guenée.

Described from one female specimen received from C. F. Baker under his No. 18623, and said to have been reared from the above-named host.

OPIINÆ

Opius lepidus sp. nov.

This species differs from *O. philippinensis* Ashmead as well as most of the other species of the genus by having the notauli complete and strongly foveolate. This character, combined with the fact that the ovipositor is scarcely at all exserted, the second tergite finely coriaceous, and the second abscissa of radius much longer than the first intercubitus, will distinguish the species from any of the described Oriental or Australian species of Opiinæ.

Female.—Length, 1.35 millimeters. Head strongly transverse, as viewed from above, appearing fully three times as broad as long, polished, impunctate; the face moderately hairy without distinct punctures and without a distinct median ridge; clypeus subtruncate anteriorly and forming with the mandibles a narrow transverse opening; antennæ 20-jointed, a little longer

than the body, and inserted distinctly above the middle of face and above the middle of the eyes. Thorax short and mostly polished; mesoscutum broader than long, moderately hairy and smooth, with the notauli complete, of an equal depth throughout, and strongly foveolate for their whole length; transverse suture basad of scutellum broad with three very distinct cross-carinæ; scutellum flat and polished; mesopleura shining, very faintly reticulate, the sternauli broad and with distinct transverse rugæ; propodeum with a strong transverse carina before the middle, dividing the segment into a short anterior or dorsal portion and a somewhat longer posterior portion, the anterior area rugosely sculptured with a short median carina, the posterior area more nearly smooth and more or less distinctly divided by longitudinal carinæ into six subequal areas; hind metatarsus about equal to the two following tarsal joints combined; forewing longer than the body; stigma lanceolate; radius originating from approximately the basal one-third of stigma and attaining the wing margin very slightly before the extreme wing apex; first radial abscissa shorter than half the width of stigma, second abscissa one and one-half times the first intercubitus; recurrent nervure joining second cubital cell; brachial cell completely closed; nervulus slightly postfurcal; abdomen ovate, as long as thorax and about as broad; first tergite slightly longer than broad, distinctly longitudinally rugulose except the posterior lateral angles which are narrowly depressed and smooth; coalesced second and third tergites coriaceously sculptured except a narrow apical margin, the suturiform articulation entirely effaced; fourth tergite polished and equal to approximately one-third the preceding; tergites beyond the fourth retracted and entirely concealed from above; ovipositor sheaths short, concealed from above or with only the extreme tip visible. Color very dark reddish testaceous, the head and abdomen a shade darker than the thorax; the abdomen, at least at apex, more or less piceous; antennal flagellum dark reddish brown, the scape and all legs slightly more yellowish than the thorax, wings hyaline, stigma and veins brownish.

Type locality.—Los Baños, Philippine Islands.

Type.—Catalogue No. 26760, United States National Museum.

Described from three females received from C. F. Baker under his No. 18879 and said to have been reared from galls on *Phyllanthus.*

ALYSIIDÆ

ALYSIINÆ

Phaenocarpa (Asobara) bactrocerae sp. nov. Plate 1, fig. 3.

This species runs straight to *Asobara* in Szepligeti's key to the genera of Alysiidæ [1] and resembles very closely *Asobara orientalis* Viereck [2] with the type of which it has been compared. The head of *orientalis* is darker than its mesoscutum and the mesoscutum is divided by a dark, apparently subtegumentary, median longitudinal line. In *bactrocerae* the head is distinctly paler than the mesoscutum and the latter is without a trace of the median longitudinal line. *Asobara antipoda* Ashmead, the type of which has not been seen, apparently differs from *bactrocerae* by having a longer ovipositor and in the black color of the thorax beneath and the abdomen.

Female.—Length, 2 millimeters. Head, thorax, and abdomen smooth and polished. Antennæ 26-jointed, nearly twice as long as the body, the third and fifth joints subequal and each about three-fourths the length of the fourth; mandibles with three apical teeth, the median tooth narrow at base, acute at apex and extending distinctly beyond the other two, both of which are short and broadly rounded or subtruncate at apex; occiput above and the vertex divided by a dark median longitudinal subtegumentary line which extends from the ocelli to the neck; mesoscutum with a small, round, deep, dimplelike median impression in front of the scutellum, the notauli impressed at the lateral anterior angles but almost effaced dorsally; disk of scutellum rectangular in outline, a little broader than long, the suture between it and the mesoscutum broad and divided medially by one longitudinal carina; propodeum polished with a narrow, parallel-sided, carinately bounded area at the middle, extending from the posterior margin of propodeum three-fourths of the distance to the anterior margin and connected with the anterior margin by a short median carina, the costulæ absent; pleura smooth and polished, the sternauli weakly foveolate; forewing equal in length to the body, with rather long and moderately dense cilia; stigma rather small, thickest at the origin of radius; first radial abscissa distinct but equal to less than half the width of stigma in length; second radial abscissa long, equal to nearly twice the length of first intercubitus; second cubital cell narrowed

[1] Genera Insectorum, Braconidæ, Fasc. 22 (1904) 200.
[2] Proc. U. S. Nat. Mus. 44 (1913) 639.

slightly at apex, radial cell large, the third abscissa of radius more than twice as long as the second abscissa and reaching the wing margin at the extreme apex of wing; recurrent nervure joining the first cubital cell; nervulus interstitial or very nearly so; brachius entirely effaced, the brachial cell open behind; subdiscoideus interstitial with discoideus, effaced apically, the stub barely longer than the recurrent vein; abdomen a little longer than the thorax, smooth; first tergite one and one-half times as long as broad at apex, smooth and polished, elevated medially on the apical two-thirds, and with two longitudinal carinæ dorsally which originate one on each side at the lateral margin just anterior to the spiracle and extend in slightly converging lines to the apex of segment; ovipositor sheaths about one-third the length of the abdomen; ovipositor curved upward at apex. Head, scape, pedicel, prothorax, first tergite, and apex of abdomen beneath yellowish testaceous; thorax, except prothorax, and abdomen, except as noted, dark rufous approaching piceous; antennal flagellum dark reddish brown, the apical eight joints white; legs yellowish testaceous, the coxæ slightly paler than the femora; ovipositor sheaths and wing veins dark brown; wings hyaline.

Male unknown.

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26761, United States National Museum.

Host.—*Bactrocera umbrosa* Fabricius.

Described from three females received from C. F. Baker and said by him to have been reared from the above-named fruit fly which commonly infests the jack fruit (*nangka*) in the Philippines. Baker further states in his letter of transmittal that the fly, while common, never does great damage on account of this parasite which may emerge in hundreds from one small infected portion of a fruit.

CHALCIDOIDEA

CALLIMOMIDÆ

PODAGRIONINÆ

Genus **PODAGRION** Spinola

The following key will help to distinguish the three species of this genus thus far known from the Philippines:

Key to species of Podagrion from the Philippines.

1. Propodeum with two distinct carinæ originating at the middle of anterior margin and diverging posteriorly to terminate at the posterior lateral angles ..... 2.

Propodeum without such carinæ; surface of propodeum irregularly rugose-reticulate; hind coxæ slender; anterior and middle coxæ, and the posterior pair except at base, pale yellowish.
P. ashmeadi Crawford.

2. Propodeum irregularly rugose-reticulate; ovipositor no longer than the body; head and thorax bluish black..... **P. philippinensis** Crawford.
Propodeum with nearly uniform close thimblelike punctures; ovipositor distinctly longer than the body; head green; thorax blue or blackish, with only a faint greenish tinge..... **P. sinensis** (Walker).

Podagrion sinensis (Walker).

Four female specimens of what appears to be this species were received from C. F. Baker under his No. 18878. These specimens were taken at Manila, Philippine Islands, by Reverend Robert Brown and were turned over to Professor Baker when Father Brown left the Islands. The host is not known.

CHALCIDIDÆ

CHALCIDINÆ

Genus **BRACHYMERIA** Westwood

As pointed out by Gahan and Fagan,[3] *Chalcis* Fabricius and *Smiera* Spinola have the same genotype and the name *Chalcis* Fabricius should be used for the group of species heretofore placed in *Smiera* Spinola (equals *Smicra* of authors). *Chalcis* of authors (not Fabricius) should take the name *Brachymeria* Westwood. In naming the following new species, *Brachymeria* is used in the sense of *Chalcis* of authors.

Brachymeria excarinata sp. nov.

The carina separating the face from the cheeks runs straight to the eye margin and is without the backward-directed branch present in most members of the genus. In this respect it agrees with *ovata* Say, but it differs from that species by lacking any suggestion of a tooth or tubercle on the underside of hind coxæ, the abdomen is more acuminate at apex, and the sixth tergite is less coarsely sculptured. Both *hirtifrons* Ashmead and *prodeniae* Ashmead lack the carina on the cheek. The former differs from the new species by being far less coarsely punctate on the dorsum of thorax, the mesoscutum and scutellum being finely shagreened and shining with widely separated, small, round punctures; by having the first tergite distinctly finely and closely punctate; and by having the abdomen very blunt at

[3] Bull. U. S. Nat. Mus. 124 (1923) 31.

apex. The species *prodeniae* is much smaller than the new species, its sixth tergite is not longer than the fifth and the hind tibiæ are almost entirely black.

Female.—Length, 4 millimeters. Occiput shagreened; vertex umbilicately punctate; frons laterad of the antennal groove, face, cheeks, and temples rugulose; clypeus shining with a few shallow punctures; antennal groove polished within; antennal flagellum nearly the same thickness throughout; funicle joints subequal in length and quadrate, none of them transverse; pronotum above, mesoscutum, scutellum, and axillæ with close umbilicate punctures, the scutellum margined at apex but not bilobed; propodeum with coarse irregular rugose-reticulate sculpture; submarginal vein nearly two and one-half times as long as the marginal; postmarginal a little less than half as long as marginal; hind femora with nine small teeth on the ventral margin, the three nearest base of femora considerably broader but not much longer than those toward apex; abdomen as long as the thorax, pointed ovate, not bluntly rounded at apex as in many species; first tergite polished impunctate; second to fifth shining but weakly punctate or shagreened over most of their surfaces; sixth subopaquely shagreened but without coarse punctures, fully twice as long as the fifth tergite and about twice the length of seventh; tip of ovipositor barely showing.

Black; antennæ black, the apex of club brownish; tegulæ, small apical spot on all femora, front tibiæ outwardly for their whole length, middle tibiæ at base and apex, and incomplete broad band on hind tibiæ near base and another at apex, and all tarsi pale lemon yellowish, the apices of tarsi more or less brownish; venter of abdomen toward apex more or less brownish; wings hyaline, the venation dark brown.

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26762, United States National Museum.

Host.—*Cnaphalocrocis medinalis* Guenée.

Described from one female received from C. F. Baker under his No. 18621, and said to have been parasitic upon the above-named lepidopteron.

CLEONYMIDÆ

CLEONYMINÆ

Genus **PYCNETRON** novum

This genus apparently differs from all other cleonymid genera in the strongly compressed abdomen. In Schmiedeknecht's key

to the genera of Cleonyminæ [4] it runs to *Anoglyphis* Foerster, but may be distinguished by the absence of a median carina on propodeum and by the presence of three ring joints in the antennæ, as well as by abdominal characters.

Head large, transverse, broader than the thorax, receding behind the eyes, the occiput not concave; ocelli in a very low triangle, almost in a line; viewed from in front the head is somewhat broader than high, subquadrate in outline with the cheeks rounded and the vertex a little convex; viewed from the side the head is only slightly convex in front; eyes ovate; malar space equal to nearly half the eye height, malar groove distinct; mandibles broad with four strong subequal teeth, the ventral tooth slightly the longest; face with converging striæ; antennæ inserted at middle of head, placed close together at base; antennal depression extending to the front ocellus, rather deep, parallel-sided, the sides rounded and immargined; antennæ 13-jointed; scape straight, cylindrical, reaching to the front ocellus; pedicel longer than broad; three distinct ring joints; funicle 5-jointed, the first joint nearly twice as long as the pedicel, all joints cylindrical and longer than broad; club 3-jointed, not thicker than the funicle and about equal to the last two funicle joints combined; pronotum transverse, as broad as the mesonotum, perpendicularly truncate anteriorly, slightly shorter at the middle than at the sides and about one-third as long at the middle as the mesoscutum; parapsidal grooves complete; axillæ broadly separated; scutellum high, convex, about as broad as long, perpendicularly truncate at apex, with a transverse furrow just before the truncation so that the dorsal apex appears margined by a transverse carina; propodeum short with distinct lateral folds but without a median carina, the spiracles large and ellipsoidal; prepectal plate wedge-shaped and very small; legs normal, the anterior and posterior femora not especially swollen and not denticulate or excised beneath; hind tibiæ with two distinct unequal spurs; marginal vein about half as long as the submarginal, and not quite as long as the postmarginal; stigmal about one-third as long as marginal, gradually thickening from base to apex and with a short uncus; hind wing with the costal cell reaching to the hooklets; abdomen sessile, very strongly compressed, almost linear as viewed from above, distinctly longer than the head and thorax, conic-ovate in lateral view; seventh tergite tubular and as long as the three preceding tergites com-

[4] Genera Insectorum, Fasc. 97 (1909) 154.

bined with its spiracles near the apex; ovipositor sheaths extending a little beyond apex of seventh tergite.

The male agrees with the female in every way except that the antennæ have two ring joints and a 6-jointed funicle, while the abdomen is no longer than thorax, not strongly compressed but slender and depressed or impressed above and keeled beneath, the seventh tergite shorter than sixth and not tubular but triangular.

Pycnetron curculionidis sp. nov. Plate 1, fig. 1.

Female.—Length, 5.6 millimeters. Head strongly reticulate and slightly shining, the cheeks a little less strongly reticulated, and the face from slightly below the antennæ with fine striæ which converge at the mouth; three antennal ring joints subequal and each approximately twice as broad as long; first funicle joint twice as long as broad, the following joints successively shortening, the fifth one and one-half times as long as broad; club joints not very distinct, the sutures fine and shallow; pronotum rugose; mesoscutum, axillæ, and scutellum with close thimblelike punctation, opaque; propodeum finely reticulate, with deep lateral folds and another carinate fold mesad of and close to the spiracle; mesopleura closely punctate but with a perfectly smooth spot below the base of posterior wing; discal ciliation of forewing moderately coarse and uniform, the base of wing bare except that the costal cell is nearly uniformly ciliated and there is a small triangular patch of cilia behind the apex of submarginal vein; hind wing reaching only to the apex of stigmal vein, nearly uniformly ciliated but the ciliation weaker than that of forewing; first abdominal tergite incised at the middle, comprising about one-sixth of the length of abdomen, tergites 2 to 6 successively increasing slightly in length, the sixth about equal to the first; seventh twice as long as the sixth; all tergites shining but with very faint reticulation.

Color black; antennal scape and club reddish testaceous, rest of the antennæ brownish black; all tarsi pale testaceous; all tibiæ brownish testaceous, the femora brownish black; coxæ bluish black; abdomen brownish testaceous beneath, black above with a faint metallic luster; ovipositor sheaths black; wings hyaline.

Male.—Length, 4.2 millimeters. Similar in every way to the female, except for the characters given in the description of the genus and the fact that the first funicle joint is somewhat less than twice as long as thick, the club is testaceous only at the

extreme apex, the femora are perhaps a little darker, and the abdomen is brownish testaceous only at base beneath.

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26763, United States National Museum.

Host.—*Acicnemis filicornis* Hubenthal.

Described from one female and one male received from C. F. Baker under his No. 18871, and said to have been parasitic upon the above-named curculionid.

EUPELMIDÆ

Metapelma atrotegularis sp. nov.

This may be *M. rufimana* Westwood, described from Borneo, but differs from the description of that species by being somewhat larger, with the oviduct very slightly more than half as long as the abdomen, and the fifth antennal joint not perceptibly shorter than the fourth. Westwood does not describe the antennal characters except by inference in comparing with *gloriosa* Westwood.

Female.—Length, 8 millimeters; ovipositor, 4.3. Vertex weakly shagreened and with scattered punctures; frons finely shagreened with the punctures much closer than on the vertex, sericeous; face rugulose-punctate and like the frons sericeous; eyes converging above and moderately hairy; head behind the eyes less strongly sculptured than the face; ocelli in a nearly equilateral triangle, postocellar line somewhat longer than ocellocular, the latter approximately equal to the diameter of an ocellus or only a trifle shorter; antennal scape thickened toward apex; pedicel about one and one-half times as long as the first funicle joint, the latter approximately twice as long as thick; second funicle joint distinctly much longer than pedicel and first funicle joint combined, equal to the scape; third funicle joint equal to the second (following antennal joints missing); prothorax and mesothorax sericeous, finely and nearly uniformly shagreened above and below; the mesepisternum above nearly destitute of pile and finely longitudinally lineolate along the dorsal margin posteriorly; mesonotum rather shallowly depressed, the lateral ridges with a distinct carinate line or fold running the full length; axillæ meeting, not strongly sculptured; scutellum approximately one and one-half times as long as broad, strongly margined laterally, and faintly margined at apex, sides parallel; metanotum with a median, triangular, flattened process extending posteriorly to the middle of propodeum; propodeum weakly sha-

greened, without carinæ, the spiracles large and circular; middle legs long and slender, the basal joint of their tarsi not much thickened and rather weakly spined beneath; middle tibiæ spurs as long as basal joint of tarsi; hind tibiæ compressed and expanded behind, the expansion extending from near base to apex and at its broadest point about as wide as the tibia, broadest near the middle; wings reaching beyond apex of abdomen; marginal vein much shorter than submarginal, about four times as long as stigmal; postmarginal distinctly longer than marginal; abdomen conic-cylindrical, slightly compressed, about equal to thorax in length but not as broad as thorax, the basal tergite emarginate at apex; ovipositor exserted very slightly more than the length of abdomen. Head metallic green tinged with cupreous on middle of frons; an area surrounding the ocelli and the lower part of frons bluish; mandibles brown, their apices black; antennal scape metallic beneath, black above; flagellum black; thorax aëneo-cæruleous variegated with purple, black, and cupreous; pronotum and mesonotum dark aëneous, the middle of scutum more greenish; axillæ blue-green; scutellum purplish black; propodeum bright brassy green; thorax beneath and all coxæ bright metallic blue-green with strong purplish reflections on the pleura; abdomen purplish black, the tergites laterally, except the last, with a large area bright metallic green; wings distinctly infuscated from the stigmal vein to apex, subhyaline basad of stigmal vein; tegulæ dark aëneous, nearly black; anterior and median legs except coxæ rufous; the median tarsi blackish, more or less rufous at base; hind femora black, the basal fourth more or less rufous, and extreme apex white; hind tibiæ black with a white band at base; metatarsus black on basal three-fourths, apical fourth and following joints white; ovipositor sheaths black.

Type locality.—Dapitan, Mindanao, Philippine Islands.

Type.—Catalogue No. 26764, United States National Museum.

Described from one female received from C. F. Baker under his No. 13898.

Metapelma tenuicrus sp. nov.

This can be distinguished from other species known to me by the narrow lamellæ of hind tibiæ.

Female.—Length, 5.2 millimeters; ovipositor, 4.8. Antennal scape club-shaped; pedicel not quite one and one-half times as long as first funicle joint; second and third funicle joints nearly equal in length and each about as long as the scape; fourth funicle joint a little more than half as long as third; following

joints of funicle gradually shorter; club approximately twice as long as thick at base, obliquely truncate; postocellar line very slightly longer than the ocellocular; pronotum and mesoscutum very weakly reticulately sculptured; lateral ridges of mesoscutum each with a weak carinate line or fold extending their full length; scutellum a little more than one and one-half times as long as broad, distinctly margined laterally and more delicately so at apex; mesopleura a little more strongly sculptured than mesoscutum; median process on the metanotum not extending to the middle of propodeum; spur of middle tibia a little shorter than the basitarsus; hind tibiæ compressed but the lamellæ very narrow, originating at about basal one-sixth and extending to apex and at no point as broad as the thickened portion of tibiæ.

Vertex and greater part of frons dark cupreous; ocellar triangle, lower part of frons, and most of face bluish green; cheeks and posterior part of head brassy green; pronotum and mesoscutum bright coppery, a little darker laterally; axillæ green; scutellum and metanotum bluish black; propodeum coppery; underside of thorax and the coxæ bright metallic green, the mesopleura more or less blue and purplish anteriorly and along the dorsal margin; abdomen blackish with the sides more or less strongly tinged with coppery; fore and median legs including their tarsi mostly rufous; hind femora black except a very narrow white band at extreme apex; hind tibiæ black with a very narrow white band at base; basal two-thirds of hind basitarsus black, the remainder of tarsi white.

Otherwise agrees with the description of *atrotegularis*.

Type locality.—Iligan, Mindanao, Philippine Islands.

Type.—Catalogue No. 26765, United States National Museum.

Described from a single female specimen received from C. F. Baker under his No. 13902.

Metapelma speciosa sp. nov.

Apparently close to *M. rufimana* Westwood but larger and with the middle tarsi black, white at base, the tegulæ whitish, and the ovipositor more than half the length of body. Differs from *albisquamulata* Enderlein in the color of the hind femora and also in having the thorax distinctly finely sculptured.

Female.—Length of body, 9.5 millimeters; ovipositor, 7. Postocellar line distinctly longer than the ocellocular line; antennal pedicel only slightly longer than first funicle joint; second funicle joint distinctly, though not a great deal, longer than the

scape and fully twice as long as pedicel and first funicle joint combined; third funicle joint equal to scape; fourth joint of funicle approximately half the length of third; following joints gradually diminishing in length outwardly; club short and obliquely truncate, indistinctly 3-jointed; mesoscutum moderately depressed medially, the lateral ridges each with a fine carinate line running their whole length; middle tibial spurs not quite as long as the basal joint of tarsi; expansion of hind tibia extending from near base to apex, broadest beyond the middle, the lamella or flange at its broadest point fully twice as broad as the tibia itself; abdomen a little longer than the thorax; ovipositor exserted the length of thorax and abdomen. Head metallic green; spot on vertex and two oval spots, contiguous anteriorly, on the middle of the frons cupreous; antennal scape blackish above, fulvous beneath; proscutum and mesoscutum and scutellum purplish black, middle of mesoscutum greenish; underside of thorax metallic green, the mesopleura above purplish; axillæ blue-green; propodeum bright green; middle tarsi pale at base; hind femora at base beneath rufous; tegulæ yellowish white; abdomen blackish, spotted with metallic green laterally. Otherwise agrees with the above description of *atrotegularis*.

Type locality.—Dapitan, Mindanao, Philippine Islands.

Type.—Catalogue No. 26766, United States National Museum.

Described from one female specimen received from C. F. Baker under his No. 13900.

Oodera ornata sp. nov.

This beautiful species resembles very closely *O. gracilis* as described and figured by Westwood [5] but can be distinguished from that species at once by the much shorter ovipositor and the differently colored legs. From *rufimana* Westwood it differs by having the head metallic green instead of black, the face brilliant brassy green, and the ovipositor is apparently somewhat shorter. It is much larger than *obscura* Westwood and not wholly obscure aëneous as that species is said to be.

Female.—Length, 10 millimeters; ovipositor, 1.6. Head nearly circular as viewed from in front; face coarsely irregularly rugose-striate, the rugæ curving from the eye margins and converging toward the mouth; eyes converging above; vertex narrow; ocelli rather small, in an acute triangle, the posterior

[5] Thesaur. Entom. Oxon. (1874) 145, pl. 27, fig. 9.

pair separated by approximately the diameter of an ocellus and nearer to the eye margin than to each other; antennal grooves deep, separated at base by a broad triangular rugose-punctate plate, confluent above; area between the antennal groove and eye margin above the middle of frons narrow, elevated, with six or seven large punctures on the crest of the elevation causing it to appear crispate; antennal flagellum thickest at the middle, tapering slightly toward base and apex; scape slightly thickened beyond the middle, curved, and reaching to the front ocellus; pedicel about two and one-half times as long as thick and about three-fourths as long as first funicle joint; second funicle joint the longest, one and one-half times the first; following joints rapidly diminishing in length, the last joint conical and a little longer than penultimate; pronotum finely transversely wrinkled above, with fine curving longitudinal striæ laterally; metallic-colored portion of the mesonotum rugose-punctate, blackish portion finely transversely rugulose; anterior half of axillæ rugose-punctate, posterior half weakly irregularly rugulose; scutellum a little broader than long, regularly rounded posteriorly, distinctly and completely margined laterally and posteriorly, rather coarsely longitudinally rugose-striate, the groove at base angled in the middle and distinctly foveolate; propodeum coarsely rugose dorsally, strongly rugose-punctate on the sides; underside of thorax for the most part rugose-punctate, the mesepimeron immediately beneath the wings more weakly sculptured, lineolate; anterior femora greatly swollen, with a comblike row of short stiff erect spines along the ventral margin, a narrow patch of closely set recumbent black setæ paralleling this row outwardly and close to it, and a broad elliptical patch of the same kind of setæ on the inner surface proximad of the middle; middle tibial spur about half the length of first tarsal joint, the latter very slightly thickened with rather weak spines beneath, these spines not black but concolorous with the tarsal joint; hind legs slender with two tibial spurs; abdomen fusiform, narrower than the thorax, pointed at apex, the apical margins of tergites 1 to 5 emarginate medially, each tergite except the last with a finely sculptured metallic-colored area laterally, otherwise nearly smooth or very faintly reticulate. Marginal and postmarginal veins subequal, the marginal very slightly the longest, together equal to the submarginal; stigmal vein approximately one-third the length of postmarginal. Antennæ black, scape metallic; entire head metallic green, the face brilliant brassy green; prothorax blue-green above; mesonotum

blue-green anteriorly and laterally, the posterior two-thirds, except lateral margins, dull black with a faint reddish tinge in some lights; anterior half of axillæ blue-green, posterior half dull black; scutellum metallic green basally, the posterior two-thirds purplish black; tegulæ brownish black; propodeum bright metallic green; whole underside of thorax and all coxæ beautiful deep purple or dark greenish blue, the mesepimeron more or less brassy green; fore and median legs except coxæ mostly obscurely reddish testaceous, the front femora with a metallic blotch above toward apex and the setæ on ventral margins black; middle tibiæ more or less piceous; hind femora, tibiæ, and tarsi mostly piceous, their trochanters, base and apex of femora, and apex of tibiæ reddish; wings faintly fuscous, the infuscation strongest in the middle of forewing.

Type locality.—Davao, Mindanao, Philippine Islands.

Type.—Catalogue No. 26767, United States National Museum.

Type and a female paratype from Davao, Mindanao; also two female paratypes from Sandakan, Borneo. All collected by C. F. Baker.

This species is rather variable in size. The paratype from Mindanao is fully 12 millimeters in length while one of the paratypes from Borneo is barely 7 millimeters long. Otherwise all appear to be exactly alike.

ENCYRTIDÆ

ENCYRTINÆ

Encyrtus barbatus Timberlake.

One female of this species, received from C. F. Baker and bearing his No. 19729, was taken on Basilan Island, in the Philippines. The host is not indicated.

PTEROMALIDÆ

PTEROMALINÆ

Pteromalus luzonensis sp. nov.

Female.—Length, 2.5 millimeters. Like the well-known *P. puparum* Linnæus, except that the mesoscutum is not trilobed anteriorly, the parapsidal grooves being almost entirely effaced; the punctures of mesoscutum and scutellum are slightly larger and deeper, giving a more rugose and more opaque appearance; the mesoscutum is more transverse, being a little shorter, or at least not longer, than the scutellum; the scutellum is sculptured alike all over with very faint indication of a transverse furrow

before apex (quite distinct, though shallow and narrow in one paratype); the propodeal neck is distinctly margined at the sides by continuation of the lateral folds; the abdomen is somewhat broader than the thorax; head and thorax deep black or blue-black without any of the metallic green or brassy reflections of *puparum;* abdomen polished black with the first tergite steel blue and the other tergites giving off bluish or purplish reflections in some lights. Otherwise indistinguishable from *puparum.*

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26768, United States National Museum.

Described from four female specimens received from C. F. Baker under his No. 19728, and said to have been reared from the pupa of *Papilio* sp.

SPALANGIINÆ

Cerocephala (Parasciatheras) dinoderi sp. nov.

This agrees very well with the description of *P. caelebs* Masi except that it is the opposite sex. It is not improbable that the two will prove to be the same, but owing to the widely separated type localities and the fact that Masi's species is known only from a unique male while the present form is represented by a single female it is deemed best to give the Philippine form a different name until the identity of the two can be more firmly established.

Female.—Length, 2 millimeters; ovipositor, 0.4. Head viewed from in front about as long as broad, the cheeks rounded and the vertex convex; face below antennæ striate, the striæ converging at the clypeus; longitudinal ridge between the antennæ distinct and surmounted by a delicate carina; remainder of head perfectly smooth and polished; ocelli in a slightly obtuse triangle, the ocellocular line subequal to the distance from a lateral ocellus to the front ocellus, the postocellar line somewhat longer; occiput delicately margined; antennæ inserted about on a line with the lower extremities of the eyes; scape slender at base, the apical two-thirds distinctly thicker and subcylindrical; pedicel a little longer than broad and very slightly longer than the first funicle joint; funicle 6-jointed, the joints distinct and gradually thickening toward the apex; first funicle joint the smallest, very slightly longer than broad; second to sixth subequal in length but successively increasing in thickness, the second a little longer than broad, the sixth a little broader than long; club conic-

ovate, not thicker than the last funicle joint, about as long as the three preceding funicle joints combined and indistinctly 3-jointed, the sutures subobsolete; pronotum slightly longer than the mesoscutum, rounded in front and perfectly smooth, except the neck which is finely rugulose; mesonotum trilobed and polished, impunctate, the parapsidal grooves deeply impressed and strongly curved off laterally, the parapsides short; scutellum and axillæ smooth and polished, the scutellum flat, about as broad as long down the middle and broadly rounded at apex; axillæ distinctly separated and set off from the scutellum by complete foveolate grooves; propodeum finely rugulose, opaque, without either folds or carinæ; mesopleura anteriorly distinctly sculptured, posteriorly practically smooth; metapleura polished; forewing with the marginal and submarginal veins subequal; stigmal approximately one-fifth as long as the marginal, not thickened at apex; postmarginal a little shorter and slenderer than the stigmal; postmarginal and marginal veins with about thirty marginal bristles and a conspicuous tuft of black bristles at the junction of submarginal with marginal; discal ciliation subobsolete; marginal cilia moderately long and terminating at the posterior apical portion of the wing; on the underside of the venation at the junction of stigmal and marginal veins there are about six or seven long hairs; marginellan vein of hind wings longer than the submarginellan, the marginal cilia present along the entire posterior margin; abdomen a little shorter than the head and thorax, strongly petiolate, elliptical in outline; petiole as long as the hind coxæ, distinctly rugulose-punctate; rest of the abdomen perfectly smooth and polished; second tergite deeply emarginate medially; ovipositor sheaths a little longer than the petiole.

Head piceous above, face and cheeks brownish testaceous; antennal scape and all funicle joints concolorous with the face; club blackish; pronotum anteriorly and laterally, propleura, mesopleura, sternum, metapleura, and legs including all coxæ dark reddish testaceous, the mesopleura stained with blackish medially; posterior middle of pronotum, mesonotum, axillæ, scutellum, and abdomen, except the petiole, black; propodeum dark brownish above, reddish testaceous laterally and at apex; abdominal petiole brownish on basal half, testaceous apically; ovipositor sheaths testaceous with the apical one-third black; wings hyaline, with a yellowish cloud extending from the stigmal vein to or nearly to the posterior margin of the wing.

Male unknown.

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26769, United States National Museum.

Host.—Dinoderus minutus Fabricius.

Described from a single female specimen received from C. F. Baker under his No. 18617, with the above-cited locality and host record.

ELASMIDÆ

Elasmus philippinensis Ashmead.

Two specimens, said to have been reared from *Erionota thrax* Fabricius at Manila, Philippine Islands, by Reverend Robert Brown, received from C. F. Baker under his No. 18624.

EULOPHIDÆ

ENTEDONINÆ

Pleurotropis fraternus (Motschulsky).

This species can be recognized by the unusually short antennæ, the whole appendage being barely longer than the height of head. The three funicle joints combined are subequal to the scape in length, the first funicle joint subquadrate and the second and third broader than long, while the club is pointed ovate with the basal joint subquadrate, the second shorter and narrower than the basal joint and terminating in an apical spine which is as long as the second joint.

Three female specimens received from C. F. Baker under his No. 18875, and said to have been taken at Manila, Philippine Islands, by Reverend Robert Brown.

Tetrastichus clypeatus sp. nov.

Easily distinguished from other described species of *Tetrastichus* from the Philippine Islands by its nonmetallic coloration. The color combined with the very distinct median groove on the mesoscutum, the rather long antenna with its first funicle joint longer than the pedicel, the very short propodeum, and the distinctly bidentate clypeus will, it is believed, distinguish the species from any of the recorded species from the Oriental Region.

Female.—Length, 2.3 millimeters. Head viewed from in front a little broader than high, very finely and obscurely reticulated; malar space equal to half the height of eye; anterior margin of clypeus distinctly bidentate, the teeth small and rounded at apex; antennæ inserted almost on a line with the

lower extremities of the eyes, almost twice as long as the dorsoventral aspect of head; scape reaching to the front ocellus; pedicel a little more than as long as thick at apex and a little less than four-fifths the length of first funicle joint; ring joints small and apparently four in number; first and second funicle joints equal and each fully two and one-half times as long as thick; third funicle joint barely shorter than the second; club equal in length to the two preceding funicle joints, scarcely thicker than the funicle, distinctly 3-jointed, the first and second joints equal, the third slightly shorter, conical, and terminating in a short spine. Thorax above very finely lineolate-reticulate; prescutum with a distinct median longitudinal groove and a row of four or five large, shallow, not very distinct punctures on each side paralleling and close to the parapsidal grooves; scutellum broader than long, evenly rounded behind with the dorsal as well as the two lateral grooves unusually distinct; propodeum weakly sculptured and medially very short, the anterior and posterior margins at the middle almost contiguous, longer laterally; on each side of the middle and extending obliquely from the posterior lateral angles to a point on the anterior margin of the propodeum about halfway between the middle and the spiracle is a carina which sets off a triangular area inclosing the spiracle; forewings ample; marginal vein longer than the submarginal and approximately five times the stigmal; submarginal with five or six bristles on its upper surface; spurs of the middle and hind tibiæ each as long as their basitarsi; abdomen nearly one and one-half times as long as the head and thorax combined, conic-ovate, tapering evenly from second tergite, uniformly but weakly sculptured, the first tergite not long, the second to sixth tergites subequal, the seventh somewhat longer than the sixth. Color of head, pronotum, mesoscutum, scutellum, large part of first tergite dorsally, and a spot at base of seventh tergite fusco-testaceous; thoracic pleura, propodeum, and the abdomen, except as noted, pitchy black; antennal scape and pedicel testaceous, the flagellum blackish; wings hyaline, veins fuscous; legs fusco-testaceous, their coxæ more or less piceous.

Male unkown.

Type locality.—Mount Maquiling, Luzon, Philippine Islands.

Type.—Catalogue No. 26770, United States National Museum.

Described from a single female specimen received from C. F. Baker under his No. 18873, and said to have been reared from the remarkable psyllid *Dynopsylla robusta* Crawford.

SERPHOIDEA

SCELIONIDÆ

TELENOMINÆ

Prophanurus flavicorpus sp. nov.

This strikingly colored species, known only from the male sex, and said to have been reared from an unknown coccid, apparently runs to *Prophanurus* in J. J. Kieffer's key to the genera of Telenominæ [6] and agrees with the characterization of the genus. It is possible that the species is the *coccivorus* of Mayr, the male of which is insufficiently described.

Male.—Length, 0.7 millimeter. Head strongly transverse, broadly emarginate, smooth and polished, the face laterad of base of antennæ faintly reticulated; ocelli nearly in a straight line; temples very narrow; antennæ 12-jointed, not or only very slightly thickened apically; first three joints of the flagellum subequal, very slightly longer than broad and not pedunculated; following joints, except the last, broader than long and very shortly pedunculated at base; last joint ovate; mesoscutum weakly sculptured and hairy; scutellum smooth or very nearly so; forewing with moderately long marginal cilia, the longest approximately equal to one-fourth the wing breadth; stigmal vein longer than marginal and approximately half as long as postmarginal; marginal cilia of hind wing equal to the width of wing; abdomen shorter than the thorax, about one-third longer than broad and perfectly smooth, the suture between first and second tergites with a few very weak foveæ.

Head, thorax, and legs pale reddish testaceous; antennæ testaceous, the three or four apical joints usually very slightly infuscated; eyes and ocelli blackish; abdomen uniformly brownish black; wings hyaline, the venation pale.

Type locality.—Los Baños, Luzon, Philippine Islands.

Type.—Catalogue No. 26771, United States National Museum.

Described from five male specimens received from C. F. Baker under his No. 18876, and said to have been reared from an unknown coccid.

Prophanurus pacificus sp. nov.

Characterized by having the mesonotum unusually weakly punctate and shining, the head broader than the thorax and

[6] Spec. Hymenop. Eur. et Alg. 11 (1912) 7.

broadly concave behind, the first funicle joint shorter than the pedicel, and the legs testaceous.

Female.—Length, 0.92 millimeter. Head strongly transverse, broader than thorax at tegulæ, broadly emarginate behind; vertex weakly margined posteriorly, mostly polished but with very faint reticulation laterad of the front ocellus; frons perfectly smooth, a small area near the lower extremity of eyes very faintly reticulated; eyes hairy; antennæ 11-jointed; pedicel about twice as long as broad; first flagellar joint a little shorter than pedicel and not quite twice as broad as long; joints 2 and 3 successively a little shorter than joint 1; joint 4 subquadrate; club 5-jointed, the joints except the last a little broader than long; thorax ovoid, longer than broad; mesoscutum and scutellum hairy, the former weakly punctate and somewhat shining, the latter polished; pleura without sculpture; stigmal vein long, slightly thickened at apex; marginal cilia at posterior apical angle of wing about one-seventh as long as the wing is broad; cilia along the submarginal vein distinctly longer than elsewhere on the margin; marginal cilia of hind wing not quite as long as the breadth of wing; abdomen as long and as broad as thorax, ovate, rounded at apex; first tergite striate from base to apex, much broader than long; second tergite distinctly striate at base in the suture and with the striæ at the middle extended posteriorly as very faint aciculations to near the middle of tergite; remainder of abdomen polished. Black; antennal flagellum brownish black; scape and legs including coxæ brownish testaceous, the front coxæ usually piceous; wings hyaline.

Type locality.—Los Baños, Luzon, Philippine Islands.

Type.—Catalogue No. 26772, United States National Museum.

Described from four females received from Anastasio A. Rowan through H. E. Woodworth, and said to have been reared from eggs of an hemipterous insect infesting the rice plant.

Genus **PHANURUS** Thomson

J. J. Kieffer[7] has treated this genus as a synonym of *Telenomus* Haliday, thus following in the footsteps of G. Mayr.[8] At the same time Kieffer proposed several new genera, separated from *Telenomus* and from each other largely upon such

[7] Spec. Hymen. Eur. et Alg. 11 (1912) 23.
[8] Verh. Zool. bot. Ges. Wien 29 (1879) 697.

characters as whether the eyes are pilose or glabrous, whether the abdomen is smooth or striated at base, whether the frons is smooth or rugose, and upon the number of joints in the antennal club. Such differences as these are of doubtful value as generic characters. To one who has worked with the group, even casually, it is apparent that there are all stages and degrees of striation of the first and second segments of the abdomen, as well as a wide range in the sculpture of the frons. The number of joints in the antennal club is variable and very likely to be misconstrued, and can apply to but one sex at best.

As recognized by Ashmead, the genus *Phanurus* offers as good characters for separation from *Telenomus* as do those used by Kieffer for his segregates. The genotype *P. angustatus* has not been seen by me, but Thomson's description of the species leaves little doubt that it is of the same conformation as *P. ovivorus* Ashmead, *tabanivorus* Ashmead, *floridanus* Ashmead, *flavipes* Ashmead, and *emersoni* Girault. *Telenomus tabani* Mayr belongs to this group, as do also *T. benefactor* Crawford, *kingi* Crawford, and *gowdeyi* Crawford.

The above-named species are characterized by having the head not or rarely broader than the thorax, rarely more than two and one-half times as broad as long, more or less convex in front and usually not broadly emarginate behind; vertex and temples rounded off and not abruptly truncate, eyes not attaining the posterior margin of head above; abdomen of the female as long as or longer than the head and thorax, not broader than the thorax, pointed at apex, not truncate, the ovipositor usually more or less prominently exserted. The eyes are pilose, frons mostly smooth, parapsidal grooves absent, and the abdomen may be entirely smooth or the first tergite and base of the second may be striated. Other characters are as in *Telenomus* Haliday.

I am of the opinion that several of the present segregates from *Telenomus* will eventually have to be recombined with that genus, but for the present *Phanurus* appears to be as worthy of recognition as do some of the others, and the name is accordingly restored.

Phanurus rowani sp. nov.

Female.—Length, 0.8 millimeter. Head viewed from above transverse, as broad as thorax, convex in front, slightly emarginate behind, about two and one-half times as wide as long; angle formed by vertex and occiput slightly rounded, not sharply

defined; occipital carina weak and slightly below the vertex; eyes not attaining the posterior margin of head above; temples distinct, approximately one-third as wide as eyes and more or less rounded; vertex very faintly reticulated, remainder of head smooth; ocelli small, in a low triangle; viewed from in front the head is broader than high; antennæ 11-jointed; pedicel less than twice as long as broad, longer than first flagellar joint which is very slightly longer than broad; joints 2 and 3 of funicle subequal and subquadrate, 4 a little broader than long; club usually 5-jointed, although frequently with the first joint scarcely larger than a funicle joint and always smaller than the other club joints; joints 2, 3, and 4 of club subequal and subquadrate, the fifth or apical joint conic-ovate and barely longer than the others; thorax as broad as long, nearly circular in outline as viewed from above; mesoscutum very weakly sculptured, shining and sparsely clothed with short pubescence; scutellum polished; mesopleura mostly smooth; forewings rather narrow, the longest hairs of marginal fringe one-third to one-half as long as the breadth of wing; stigmal vein rather short and terminating in a very small rounded knob; marginal fringe of hind wing as long as the wing is broad; abdomen lanceolate, one-third longer than head and thorax, narrower than thorax, entirely smooth and polished except that the suture between first and second tergites is finely foveolated; first tergite transverse, usually with a low transverse ridge before the apex; second tergite longer than all of the following tergites combined; ovipositor exserted, the exserted portion variable in length, one-third as long as the abdomen in the type. Black; scape and all legs, including their coxæ, testaceous; front coxæ somewhat fuscous; pedicel and funicle joints brownish; wings hyaline.

In some specimens the abdomen is not much longer than the head and thorax. The exserted portion of the ovipositor varies in length from nothing at all to half as long as the abdomen, the sheaths as well as the ovipositor apparently being capable of complete retraction within the abdomen and the degree of exsertion depending upon the position at the moment of death of the individual insect. The width of the forewing is also variable, being equal to scarcely more than twice the length of the longest marginal cilia in some specimens, while in others it is equal to approximately four times the longest cilia.

Male.—Length, 0.7 millimeter. Head viewed from above about twice as broad as long, temples more than half as wide as the eyes, frons along the eye margins very faintly reticulated;

antennæ 12-jointed; scape subcylindrical, thickened throughout its whole length, distinctly thicker than the pedicel and flagellar joints; pedicel a little longer than broad and very slightly longer than first flagellar joint; joints 1, 2, and 3 of the flagellum thicker than the following joints which are small and moniliform; apical joint about twice as long as broad; legs a little less slender than in the female, the front tibiæ especially somewhat swollen; hind metatarsus thicker than the following joints, the tarsi tapering toward apex; abdomen about as long as thorax and narrower than the thorax; first tergite apparently lacking the transverse ridge or it is very weak; foveolation of first abdominal suture very weak.

Vertex, mesonotum, scutellum, and abdomen above and below dark brown; antennæ brownish at apex; rest of body, legs, and antennæ reddish testaceous; wings hyaline.

Type locality.—Los Baños, Luzon, Philippine Islands.

Type.—Catalogue No. 26773, United States National Museum.

Host.—*Schoenobius incertellus* Walker.

Forty females and thirteen males received from Anastasio Rowan, student at the University of the Philippines, said to have been reared from eggs of the above-mentioned rice-stem borer. Named for the collector.

Phanurus dignus sp. nov.

Very similar in general appearance to *rowani* sp. nov., but the female can be distinguished by the striated first tergite and the shorter abdomen which is not longer than the head and thorax and about as broad as the thorax. The males are distinguished at once by the black head and thorax and the non-thickened scape.

Female.—Length, 0.74 millimeter. Head viewed from above about twice as broad as long, convex in front and only slightly concave behind, the occipital carina delicate and situated below the vertex, vertex not abruptly truncate behind, temples distinct, vertex and a small area on inner orbit near lower extremity of the eye weakly sculptured, remainder of head smooth; eyes pilose; antennæ 11-jointed; pedicel about twice as long as broad; first flagellar joint longer than broad but distinctly shorter and narrower than the pedicel; joints 2 and 3 about as broad as long, 4 and 5 slightly transverse, joint 4 smaller than joint 5; club 4-jointed, the joints subquadrate and subequal, the apical joint short-ovate; thorax barely longer than broad; mesoscutum weakly reticulated and somewhat shining; scutellum polished;

longest marginal cilia of forewing about equal to one-fourth the wing breadth; marginal cilia of hind wing equal to the width of blade; abdomen as long as head and thorax, lanceolate, the first tergite transverse and distinctly longitudinally striated except at apex which is smooth, suture between first and second tergites foveolated, remainder of abdomen polished; ovipositor exserted approximately one-half the length of abdomen.

Black; legs including middle and hind coxæ pale testaceous, the front coxæ piceous; antennæ black or brownish black, the base of scape more or less testaceous; wings hyaline.

Male.—Length, 0.7 millimeter. Antennæ 12-jointed; scape slender, not thickened; pedicel barely longer than broad and scarcely longer than first flagellar joint; first three flagellar joints as thick as the pedicel and each a little longer than broad, very slightly thicker than the following which are moniliform, the apical joint ovate and twice as long as broad; abdomen no longer than the thorax and a little narrower, subovate, the apex not truncate; legs slender.

Black; antennal flagellum brownish apically; scape, pedicel, and greater part of flagellum as well as the legs, except front coxæ, pale testaceous; wings hyaline.

Other characters as in the female.

Type locality.—Los Baños, Luzon, Philippine Islands.

Type.—Catalogue No. 26774, United States National Museum.

Host.—*Schoenobius incertellus* Walker.

Eight females and thirteen males received from Anastasio Rowan, said to have been reared from eggs of the above-named rice-stem borer.

These specimens were received with the types of *rowani* sp. nov., described here, and the females are easily confused with that species unless particular attention is paid to the shape of the abdomen and the sculpture of the first tergite. The males are more easily distinguished.

CERAPHRONIDÆ

CERAPHRONINÆ

Ceraphron manilae Ashmead.

Two females, reared from *Argina cribraria* at Los Baños, Philippine Islands, received from C. F. Baker under his No. 18625.

ILLUSTRATION

PLATE 1

FIG. 1. *Pycnetron curculionidis* g. et sp. nov., female; *a*, antenna of male; *b*, lateral view of female abdomen.

2. *Spathius dinoderi* sp. nov., forewing.

3. *Phaenocarpa* (*Asobara*) *bactrocerae* sp. nov., female.

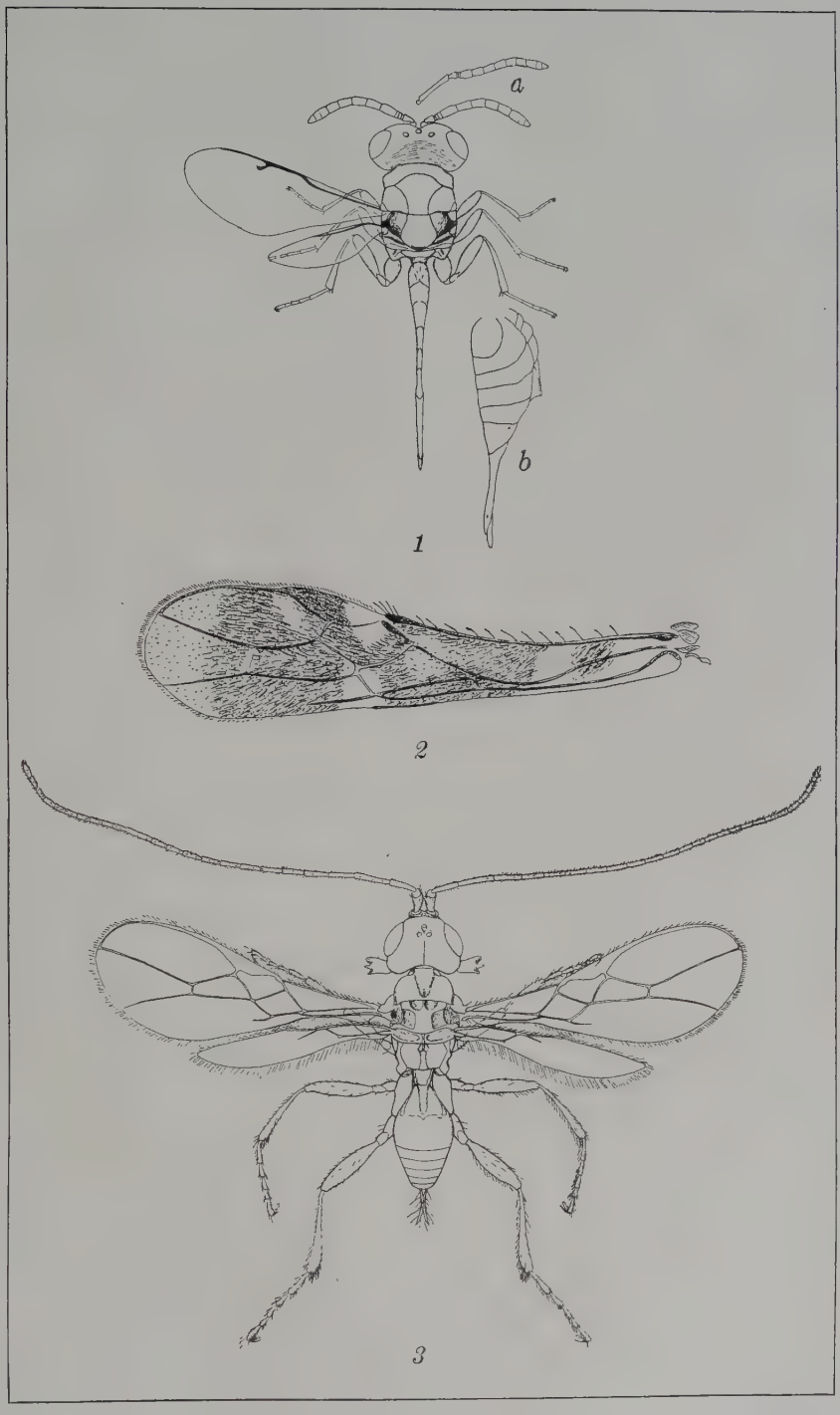


PLATE 1.

THE BUMBLEBEES OF THE PHILIPPINE ISLANDS (BREMIDÆ: HYMENOPTERA)[1]

By THEODORE H. FRISON

Of Urbana, Illinois

ONE PLATE

The present paper is the result of a study of a series of specimens of bumblebees very kindly sent to me from the Philippine Islands by Charles Fuller Baker, and of a specimen of *Bremus mearnsi* (Ashmead) sent to me by S. A. Rohwer from the collection of the United States National Museum. In this paper a complete summary, to date, is given of our systematic knowledge of the bumblebees of this region, together with such additional facts as have been obtained by the study of the above-mentioned material.

Bremus mearnsi (Ashmead) (**bakeri** Cockerell = var.).

Ashmead (1905) had the honor of describing the first species of bumblebee, *Bremus mearnsi,* from the Philippine Islands. This species was described from a single specimen of the worker caste taken on Mount Apo, Mindanao, at an altitude of about 1,800 meters. In addition to this type worker, the United States National Museum possesses a large female bumblebee which is undoubtedly the queen of this species. This queen, according to the label on the specimen, comes from the "Apex of Mt. Malindang, Mindanao, P. I." and was collected on "7–6, 1906," by E. A. Mearns, the collector of the type worker. At my request, Mr. Rohwer kindly compared this queen with the type worker of *Bremus mearnsi,* and it is evident from this comparison that

[1] Numerous genera of northern plants and insects are found about the summits of the higher mountains of the Philippines, but are mostly unknown at lower altitudes. The isolated mountains are like islands; each possesses its peculiar species. Most of the higher mountains are unknown entomologically. It is extremely interesting that bumblebees, most characteristic of boreal regions, should have been found on several of the higher mountains, always near the summit. Doubtless they occur on all of our higher mountains, though they are never seen below.—C. F. BAKER.

the Mount Malindang specimen is the undescribed queen of *B. mearnsi*. The fact that the two specimens are from the same island, in a region where there are but few species of bumblebees, is further evidence in support of this conclusion. The following description is given of the previously unknown queen:

Queen.—Pubescence on front of head between and below antennæ yellowish brown, that just above antennæ and bordering median margin of compound eyes darker brown. Occipital orbits with brownish pubescence, with numerous small punctures. Occiput with a triangular patch of chocolate brown hair. Labrum with tuberclelike areas, which are prominent, shiny, and with few punctures, the space between them nearly equal to the length of the second flagellar segment; shelflike projection broad, strongly punctate; pubescence yellowish brown, almost golden in color. Mandibles distinctly three-toothed; there is, however, a much less developed fourth tooth at the lower apical angles; setæ on distal portion of mandible between the raised, smooth, longitudinal ridges very short, dense, golden in color; setæ on the lower portion much longer and of the same color as the short setæ. Clypeus smooth, shiny, with a few small punctures on its disk, and large punctures mixed with smaller ones on the lateral, dorsal, and anterior portions. Malar space slightly longer than its width at articulation of mandible (from precoila to postcoila), about one-half as long as the greatest width of, and one-fifth as long as, the compound eye, smooth, shining, but feebly punctate. Ocelli situated just above the narrowest part of the vertex; each lateral ocellus about its diameter distant from the median ocellus; area between lateral ocelli and median margin of compound eyes polished, almost impunctate. Flagellum slightly more than twice as long as the scape; third flagellar segment longer than the fifth, the fifth slightly longer than the fourth.

Dorsum of thorax and upper portion of pleura with moderately long chocolate brown pubescence, that on the lower portion of pleura yellowish; center of disk smooth and almost impunctate.

Abdomen with the first three basal dorsal abdominal segments covered almost entirely with moderately long chocolate brown pubescence, and that on the three apical segments light yellowish brown. Pubescence on the greater part of the sixth dorsal segment short, but becoming longer on lateral margins. Venter with moderately long pubescence of the same color as the dorsal apical segments fringing posterior margins of the segments.

Hypopygium without a median carina, epipygium with a slight median carina.

Legs with pubescence yellowish brown, that on the tibiæ of the middle and hind legs almost golden. Metabasitarsus distinctly arcuate and outer surface nearly flat. Corbiculæ slightly shagreened. Distal end of mesobasitarsus without a pronounced projection.

Proximal portion of the wings yellowish, distal portion distinctly suffused, nervures prominently outlined in dark brown.

Length, 19 millimeters; spread of forewing, 39; width of abdomen at second segment, 10.

Morphotype queen, apex of Mount Malindang, Mindanao. Collected "7–6, 1906," by E. A. Mearns. Deposited in the collection of the United States National Museum.

Recently Cockerell (1920) described a species of bumblebee from Negros, Cuernos Mountains, Philippine Islands, under the specific name *bakeri.* A careful comparison of a queen of *Bremus bakeri,* from exactly the same locality as Cockerell's type, reveals the fact that this form is structurally identical with the queen of *Bremus mearnsi.* Certain differences in coloration, however, justify the retention of *bakeri* as a varietal name for this color variety of *Bremus mearnsi.* The queen of *Bremus mearnsi* var. *bakeri* differs from the description just given of *Bremus mearnsi* as follows: That portion of the pubescence on the head, thorax, and abdomen of *mearnsi,* which is described as being chocolate brown, is almost black in var. *bakeri,* and in addition the greater portion of the fourth dorsal abdominal segment.

There are several minor inaccuracies in Ashmead's description of the type (worker) of *Bremus mearnsi,* which should be noted. Mr. Rohwer writes me that the pubescence on the face is mostly yellowish; that of the occiput, dorsum, and sides of the thorax brownish; that on the first three dorsal abdominal segments brownish; and that on the last three dorsal abdominal segments yellowish. Ashmead described the pubescence of the body as "Black, clothed with a long, grayish pubescence, that on the abdomen more or less yellowish, mixed with some black hairs."

According to Cockerell (1920), *bakeri* resembles *Bremus eximius* var. *tonkinensis* in coloration, but is structurally related to *Bremus irisanensis* (Cockerell). The truth of the former of these two statements is evident, but the latter statement I am very much inclined to doubt. The lateral ocelli of *Bremus*

mearnsi and its variety *bakeri*, in the queen caste, are about their diameter distant from the median ocellus. In queens of *Bremus irisanensis*, however, the lateral ocelli are much farther removed from the median ocellus than their diameter. Another conspicuous difference between these two Philippine species of bumblebees is that the outer surface of the metabasitarsus (basal tarsal segment of the hind leg) of *Bremus irisanensis* is distinctly concave, whereas in *Bremus mearnsi* and its variety *bakeri* this particular surface is more nearly flat. This and such differences as exist in the punctuation on the face and that on the tuberclelike areas of the labrum, on the areas between the lateral ocelli and the median edge of the compound eyes, the difference in length of the malar space, etc., all indicate that the Philippine species of *Bremus* thus far described belong to different groups or subgenera. The lack of males, however, prohibits a final statement as to the group or subgenus to which *Bremus mearnsi* or its variety *bakeri* belongs. *Bremus irisanensis*, as shown in this paper, belongs to the subgenus *Pratobombus* Vogt (1911). *Bremus folsomi* Frison (1923) from Borneo seems to be closely related to *Bremus mearnsi* (Ashmead).

Bremus irisanensis (Cockerell).

This species was described by Cockerell (1910) from the worker caste. The specimens came from "Irisan, Bequet Prov.,[2] Luzon, Philippine Islands, May 28." More recently Cockerell (1920) has described the male of this species and a new variety of the same which he has named *baguionensis*. Among the specimens sent me by Dr. C. F. Baker for study are two queens, five workers, and two males of this species. Of this number two queens and one of the males have the apical dorsal abdominal segments black, or mostly so, and accordingly agree in coloration with Cockerell's type worker and his description of the male. The remainder of the specimens belong to variety *baguionensis*. As the queen has not been recognized heretofore the following description is given:

Queen.—Pubescence on all parts of the head entirely black. Occipital orbits with numerous punctures. Labrum with transverse-elongate tuberclelike areas, shiny, with few punctures, separated by a narrow median fissure; shelflike projection broad,

[2] This is doubtless Benguet Subprovince. Irisan is a small Igorot settlement near Baguio. The type of *Bombus irisanensis* was probably collected by McGregor in 1903.—EDITORS.

strongly punctate; pubescence slightly ferruginous. Mandibles distinctly three-toothed, with a very slight indication of a fourth tooth at the lower apical angles; setæ near postartis (lower proximal end of mandible) very long, slightly ferruginous. Clypeus with median or disk smooth, shiny, impunctate, large punctures confined to anterior, lateral, and dorsal margins. Malar space somewhat longer than its width at articulation of mandible (from precoila to postcoila), considerably over one-half as long as greatest width of, and about one-fourth as long as, the compound eye; smooth, polished, almost impunctate. Ocelli situated well above narrowest part of the vertex; each lateral ocellus farther removed from the median ocellus than its diameter; outer half of area between lateral ocelli and median margin of compound eyes strongly punctate. Flagellum slightly more than twice as long as the scape; third flagellar segment but slightly longer than the fifth, the fifth longer than the fourth.

Dorsum of thorax and upper anterior corners of pleura with black pubescence, that on remaining areas of pleura yellow or fulvous yellow; a narrow, elongate streak in the center of the disk smooth and impunctate.

Abdomen with yellow or fulvous-yellow pubescence on the first two dorsal abdominal segments, pubescence on the remaining segments black. Pubescence on the greater part of the sixth dorsal abdominal segment short, but becoming longer on lateral margins. Venter with moderately long black pubescence fringing posterior margins of segments. Hypopygium with a slight indication of a median carina, epipygium slightly concave.

Legs with pubescence black, cuticle of legs, particularly of tibiæ and tarsi, in many places with a reddish suffusion. Outer surface of metabasitarsus distinctly concave. Corbiculæ polished. Distal end of mesobasitarsus with a pronounced toothlike projection.

Wings fuliginous throughout.

Length, 17 millimeters; spread of wings, 37; width of abdomen at second segment, 8.

Morphotype queen from Imugan, Nueva Vizcaya Province, Luzon, collected by C. F. Baker and deposited in my collection. Paramorphotype queen from Baguio, Benguet Subprovince, collected by C. F. Baker and deposited in the collection of C. F. Baker.

The coloration of the queen is quite similar to that of the worker (type), which is not always the case among the Bremidæ.

The structural characters presented by the genitalia and spathæ of the male of the typical form are identical with those described and figured for the color variety *baguionensis*.

Bremus irisanensis var. baguionensis (Cockerell). Plate 1.

As already mentioned, in addition to the typical form of *B. irisanensis* just considered, there are five workers and one male in the series sent me for study which belong to *Bremus irisanensis* variety *baguionensis* (Cockerell), a variety described from the worker caste by Cockerell in 1920. These specimens all came from near Baguio, Benguet Subprovince, Luzon, and were collected by C. F. Baker (20893). In a letter to me Doctor Baker says that these specimens all came from a—

> point called Haight's Place * * * which is near 8000 feet altitude and has occasional light frosts. *Rubus, Rosa, Quercus, Viola* and other northern genera of plants abound there.

The variety *baguionensis* is distinguished from typical specimens of *irisanensis* in having some fulvous or reddish fulvous pubescence upon the apical dorsal abdominal segments. Since the male of this variety has not been heretofore recorded, or many of the structural characters of the species itself described, the following description is given:

Male.—Clypeus and front of head both below and above antennæ covered with dense, short, whitish fulvous pubescence, intermixed with numerous long brownish setæ. Occipital orbits with pubescence of similar character and color as that on the clypeus, but much less dense; moderately punctate. Occiput with a triangular patch of pubescence similar to that on the front of head and connecting on sides with the pubescence on occipital orbits. Labrum polished, smooth, with scattered punctures; on each lateral portion a slightly elevated rounded tuberclelike area which is highly polished and almost impunctate. Mandibles almost entirely covered with a dense, golden or light ferruginous pubescence, that fringing lower edge rather long. Malar space about one and one-half times as long as its width from precoila to postcoila, over one-half as long as the greatest width of, and about one-fourth as long as, the compound eye, polished, but feebly punctate. Ocelli situated just above narrowest part of the vertex; each lateral ocellus closer to the median ocellus than its diameter; area between lateral ocelli and median margin of compound eyes polished, almost impunctate. Flagellum over three times as long as the scape; third flagellar segment shorter than the fifth and slightly longer than the fourth.

Dorsum of the thorax with ochraceous pubescence, that on the pleura considerably lighter; center of the disk smooth and impunctate.

Abdomen with the first two basal dorsal segments covered with pale fulvous pubescence, third and fourth segments with dark brownish pubescence, and last three segments with light ochraceous or light ferruginous pubescence. Venter with moderately long pubescence, of the same color as that on the first two dorsal abdominal segments, fringing posterior margins of the segments.

Genitalia (Plate 1, fig. 1) with the heads of the sagittæ sickle-shaped, their distal points being rather bluntly rounded and directed upward; volsellæ with their inner apical projections sharply pointed. Inner spatha and outer spatha are shown in Plate 1, figs. 2 and 3, respectively. The structures presented by the genitalia and spathæ show that this species of bumblebee belongs to the widely distributed subgenus *Pratobombus* Vogt (1911).

Legs with pubescence of proximal segments light fulvous, that on tarsi and fringes of metatibiæ almost ferruginous. Metatibiæ with central portion of outer surfaces bare, highly polished, resembling slightly developed corbiculæ.

Wings fuliginous, distal portion more suffused.

Length, 15 millimeters; spread of forewings, 30; width of abdomen at second segment, 6.

Allotype male of variety *baguionensis,* Baguio, Benguet Subprovince, Luzon, collected by C. F. Baker (20894). Allotype deposited in my collection.

Key to the Philippine species and varieties of Bremus.

QUEENS AND WORKERS (FEMALES)

1. First and second dorsal abdominal segments with yellow or fulvous yellow pubescence; each lateral ocellus, in queen, farther removed from the median ocellus than its diameter; outer half of area between lateral ocelli and median margin of compound eyes strongly punctate in queen, less so in worker ..... 2.

   First and second dorsal abdominal segments with black or chocolate brown pubescence; each lateral ocellus about the length of its diameter distant from the median ocellus; area between lateral ocelli and median margin of compound eyes smooth, shiny, outer portion with but few small punctures ..... 3.

2. Apical dorsal abdominal segments entirely with black pubescence. **Bremus irisanensis** (Cockerell).

   Apical dorsal abdominal segments with some fulvous or reddish fulvous pubescence ..... **Bremus irisanensis var. baguionensis** (Cockerell).

3. Pubescence of the thorax and basal dorsal abdominal segments nearly black; only the last two apical dorsal abdominal segments entirely reddish fulvous..... **Bremus mearnsi var. bakeri (Cockerell).**
Pubescence of the thorax and basal dorsal abdominal segments chocolate brown; last three apical dorsal abdominal segments entirely or nearly yellowish brown or fulvous..... Bremus mearnsi (Ashmead).

MALES [3]

1. Apical dorsal abdominal segments entirely with black pubescence. **Bremus irisanensis (Cockerell).**
Apical dorsal abdominal segments with some fulvous or reddish fulvous pubescence..... **Bremus irisanensis var. baguionensis (Cockerell).**

TABULATION OF CASTE DESCRIPTIONS OF SPECIES AND VARIETIES

Bremus mearnsi (Asmead); type, worker (1905).
Bremus mearnsi (Ashmead); morphotype, queen (antea, page 114).
Bremus mearnsi var. *bakeri* (Cockerell); queen (1920).
Bremus irisanensis (Cockerell); type, worker (1910).
Bremus irisanensis (Cockerell); male (Cockerell, 1920).
Bremus irisanensis (Cockerell); morphotype, queen (antea, page 116).
Bremus irisanensis var. *baguionensis* (Cockerell); type, worker (1920).
Bremus irisanensis var. *baguionensis* (Cockerell); allotype, male (antea, page 118).

INTRODUCED SPECIES

In the Report of the Secretary of the United States Department of Agriculture for 1909, mention is made of the introduction "of bumblebees to the Philippine Islands for the purpose of fertilizing clover." This is "reported to have been measurably successful, and American bumblebees have been found in certain regions in the Philippines during the year." Another reference probably to the same introduction is found in a bulletin of the Bureau of Entomology of the United States Department of Agriculture (1911), which is as follows:

In the same way an attempt was made to introduce the common bumblebee *Bombus pennsylvanicus* Degeer [*americanorum* (Fabr.)] of the United States into the Philippine Islands for the purpose of fertilizing red clover. These were sent in refrigerating baskets, carried by hand by Filipino students returning from the United States to the Philippines, and for the most part in the pupal stage. These were properly planted upon arrival and reared, and a few specimens have been recovered.

[3] The male of *Bremus mearnsi*, or of its variety *bakeri*, is not known.

I am not aware of any additional records of the recovery of this species and am extremely doubtful whether the species became established. This account of the introduction is repeated here in order to forestall the possibility of the species being redescribed from Philippine material if the species is established in the Islands, and to lead to a settlement of this question.[4]

BIBLIOGRAPHY

ASHMEAD, W. H. Additions to the recorded hymenopterous fauna of the Philippine Islands, with descriptions of new species. Proc. U. S. Nat. Mus. **28** (1905) 959.

COCKERELL, T. D. A. Descriptions and records of bees.—XXVIII. Ann. & Mag. Nat. Hist. VIII **5** (1910) 416.

COCKERELL, T. D. A. The social bees of the Philippine Islands. Philip. Journ. Sci. **14** (1919) 77–81.

COCKERELL, T. D. A. Supplementary notes on the social bees of the Philippine Islands. Philip. Journ. Sci. **16** (1920) 631–632.

FRISON, T. H. Systematic and biological notes on bumblebees (Bremidæ-Hymenoptera). Trans. Am. Ent. Soc. No. 835 **48** (1923) 322–323.

HOWARD, L. O. and W. F. FISKE. The importation into the United States of the parasites of the gipsy moth and the brown-tail moth. U. S. Dept. Agr. Bur. Ent. Bull. **91** (1911) 45.

VOGT, O. Studien über das Artproblem. Teil 2. Ueber das Variieren der Hummeln. Sitzungsber. Gesellsch. Naturforsch. Freunde Berlin No. 1 (1911) 31–74.

WILSON, JAMES. Report of the Secretary. Yearbook U. S. Dept. Agr. (1909) 108.

[4] In extensive collecting of Philippine bees, this species has never been encountered. Even if it survived, it would probably have been driven to the highest altitudes.—C. F. BAKER.

ILLUSTRATION

PLATE 1

FIG. 1. *Bremus irisanensis* var. *baguionensis* (Cockerell); male genitalia.
2. *Bremus irisanensis* var. *baguionensis* (Cockerell); inner spatha.
3. *Bremus irisanensis* var. *baguionensis* (Cockerell); outer spatha.

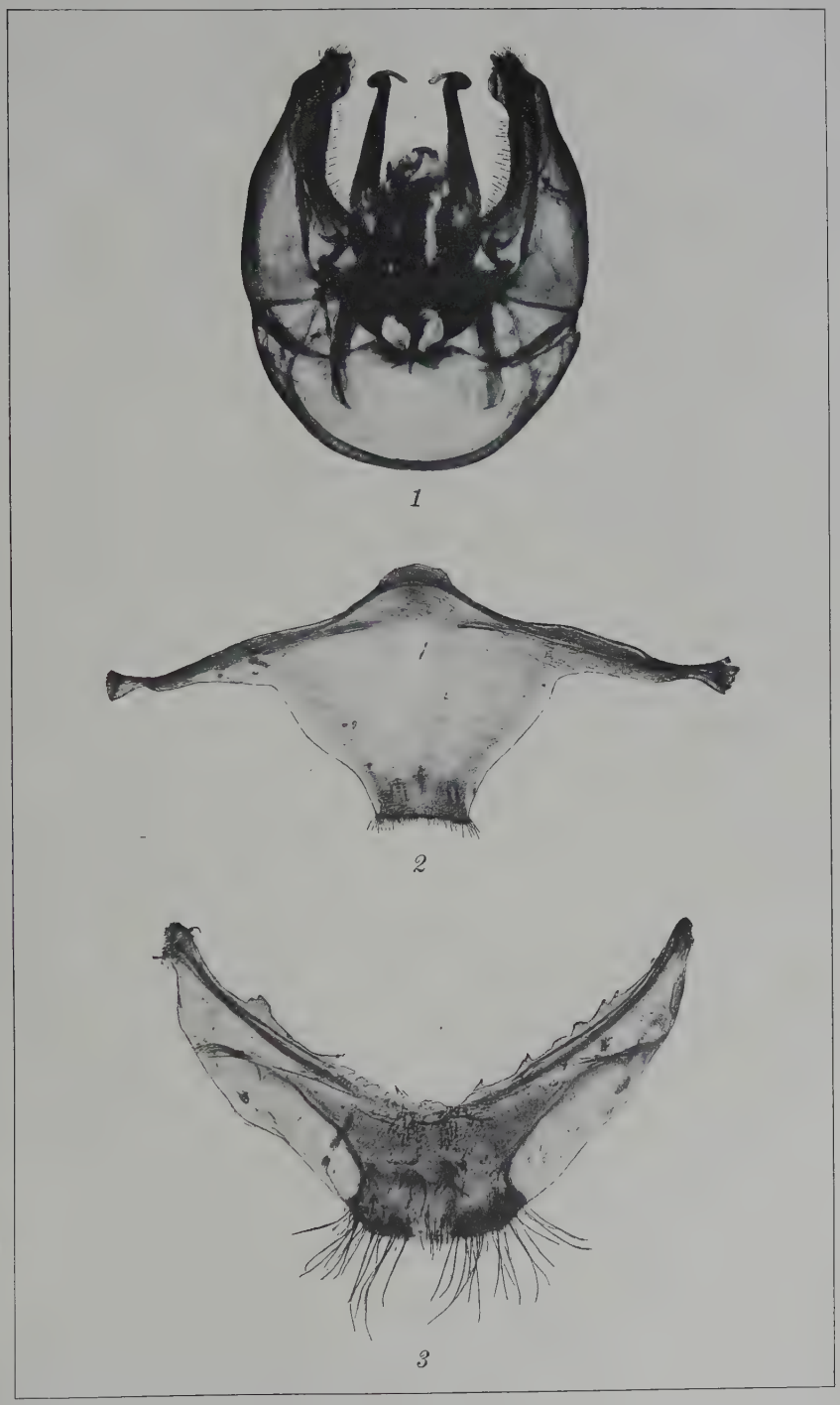


PLATE 1.

ZWEI NEUE CASSIDA-ARTEN AUS DEN PHILIPPINEN

Von Franz Spaeth

Vienna, Austria

In einer der letzten Sendungen des Herrn C. F. Baker befinden sich die folgenden zwei neue bemerkenswerte Arten der Gattung Cassida:

Cassida bakeri sp. nov.

Ovato-rotundata, valde convexa, nitida, flavo-testacea; antennae minus longae, apice vix incrassatae, articulo tertio secundo duplo longiore; clypeus subtrapezoidalis, planus, laevis; prothorax ellipticus longitudine duplo latior, antice minus, postice magis rotundatus, angulis breviter rotundatis, disco nitidissimo, laevi; elytra latitudine dimidio longiora basi sat emarginata, angulis humeralibus haud obtusis lateribus modice ampliatis, apice breviter rotundato, disco valde convexo, in basi haud retuso, profunde et sat crebre punctato-striato, callis utrinque tribus dilutioribus, multo subtilius et minus crebre punctatis, primo maximo intus a basi ad medium extenso, altero in parte protectali, ultimo apicem fere latum amplectente; protectum laeve, extus parum declive. 10 × 9 mm.

Exemplar unicum in insula Mindanao prope Surigao a domine Ch. F. Baker detectum in mea collectione conservatum est.

Eiförmig-gerundet, sehr hoch gewölbt und stark glänzend, ganz rötlichgelb, nur auf den Flügeldecken mit bräunlicher Färbung in den tiefen Stellen der Punktstreifen.

Fühler dünn aber nur mässig lang, die Halsschildecken kaum überragend, nach dem Ende kaum verdickt, mit kugeligem zweiten Gliede; das dritte, vierte, und fünfte sind 2.5 mal so lang als das zweite und als dick, unter einander ziemlich gleich, das sechste bis zehnte wenig kürzer, zweimal so lang als dick, vom siebenten an dünn behaart. Kopfschild flach, trapezförmig, mit mässig starken, vorne bogenförmig zusammenlaufenden Stirnlinien und glattem, stark glänzendem, dreieckigem Mittelstück. Halsschild elliptisch, um die Hälfte breiter als lang, vorne we-

niger, hinten mehr gerundet, mit kurz verrundeten Ecken vor der Längsmitte und glatter gewölbter Scheibe. Schildchen gleichseitig dreieckig. Flügeldecken an der Basis ausgerandet und fein gekerbt, um ein Viertel breiter als der Halsschild mit vorgezogenen, mit den Halsschildecken in einer Querlinie liegenden, wenig abgestumpften Schulterecken; die Seiten bis vor die Mitte schwach erweitert, dann im Bogen verengt, hinten kurz, sehr schwach zugespitzt verrundet; die Scheibe sehr hoch, gleichmässig gewölbt, im Basaldreieck nur sehr kurz und schwach eingedrückt; die Punktstreifen, insoweit sie nicht in die schwielig erhabenen Stellen fallen, sehr grob, tief und regelmässig, so breit als die Zwischenräume; von der Höckerstelle geht eine grosse, glatte, heller gelbe, lebhaft glänzende Schwiele aus, die nach vorne bis zur Basis reicht, an den Seiten sich in zwei kurzen Gabeln bis über den fünften Streif ausdehnt und auf dem ersten und zweiten Zwischenraum bis hinter die Mitte reicht; eine zweite solche Schwiele bildet die hohe Seitendachbrücke und zieht sich auf den letzten zwei Zwischenräumen bis zur Basis, eine dritte, weniger hohe, füllt das ganze letzte Viertel der Scheibe aus; auf diesen Schwielen sind die Punkte der Streifen viel feiner, zum Teil erloschen; die dazwischen liegenden, tieferen Stellen haben grobe Punkte mit dunkleren Höfen, so dass auf jeder Decke eine braune Längsbinde aussen von der Schulterbeule bis über die Mitte zieht, sich hier einerseits zur Naht wendet, andrerseits hinten die Seitendachbrücke umfasst; von den Streifen sind sonach der fünfte bis siebente von der Schulterbeule bis über die Mitte, die inneren aber nur im mittleren Drittel, die ersten zwei ausserdem im Basaldreieck tief und grob. Das Seitendach ist glatt und sehr stark glänzend, innen mehr, aussen wenig geneigt, vor der Seitendachbrücke nach innen erweitert. Klauen ungezähnt. Das letzte Sternit ist hinten dicht und fein runzelig gekörnt. Von *C. basilana*, der sie am nächsten steht, durch breiteren, mehr gerundeten Körper, weiter zurückliegende, breiter verrundete Halsschildecken, weniger vorgezogene, stumpfer gewinkelte Schulterecken, breiteres Seitendach, viel gröbere Punktstreifen und die Schwielenbildung auf den Flügeldecken, und schwächere Endverbreitung des Klauengliedes verschieden.

Fur die Zuweisung der hier beschriebenen Arten zur Gattung *Cassida* ist eine Begründung notwendig. Boheman hatte die zahlreichen Arten, welche er nicht in andere Gattungen einzureihen vermochte, je nach der Fühlerlänge zu *Cassida* oder *Coptocycla* gestellt; damit wurde insbesonders die letztere Gattung ungeheuer polymorph und unpräzis. Chapin hat sich darauf

beschränkt, für die *Coptocycla*-Arten mit gekämmten Klauen *Ctenochira,* für jene mit gezähnten Klauen *Chirida* als neue Gattungen aufzustellen. Ohne sich bei der letzteren Gattung lange mit der Feststellung der zugehörigen Arten aufzuhalten. und weil er hiefür auch nicht die nötige Kenntnis der einzelnen Arten besass, zählte er zwei Typen auf: *elatior* Klug und *cruciata* L., beide aus Südamerika. Eine flüchtige Durchsicht hatte ihm gezeigt, dass die Mehrzahl der amerikanischen, sowie fast alle nicht amerikanischen *Coptocycla* einen Klauenzahn haben; sie hätten also damals zu *Chirida* gestellt werden müssen. Weise, der sich zuerst um eine schärfere Abgrenzung jener Gattungen bemühte, erkannte dass *cruciata* Fühlerrinnen habe, *elatior* aber nicht, und dass daher beide nicht in derselben Gattung bleiben können. Es wäre wohl zumindest einfacher und für eine spätere Bearbeitung der Gruppe angenehmer gewesen, wenn Weise für jene Art, deren neugefundenes Merkmal ihre generische Absonderung notwendig macht, eine neue Gattung aufgestellt hätte; er verwendete jedoch *Chirida* fur *cruciata* und errichtete auf *elatior* und die anderen Arten ohne Fühlerrinnen die Gattung *Metriona,* auf die sonach der oben erwähnte polymorphe Charakter der bisherigen Gattungen *Coptocycla* und *Chirida* übergehen musste.

In einer noch nicht veröffentlichten Arbeit über die amerikanischen *Coptocycla* (sens. Boh.) werde ich *elatior* durch die Form des Klauenzahnes und die Skulptur der Flügeldecken von allen anderen bisher zu *Metriona* gestellten Arten trennen, und daher diesen Gattungsnamen auf sie allein beschränken. Noch weit weniger können dann aber die zahlreichen tropischen Arten der alten Weltteile bei *Metriona* belassen werden, da sie von *elatior* noch mehr als die amerikanischen Arten differieren. Sie weichen auch unter sich, besonders in der Klauen- und Fühlerbildung ab, während sie in sonstiger habitueller Hinsicht häufig sich ähneln. Bei *dysphorica* von den Philippinen ist zum Beispiel der Klauenzahn kräftig entwickelt, die Fühler sind sehr lang und dünn, bei *basilana, bakeri, quinquemaculata,* und *manilensis* ist die Klaue ohne Zahn und nur das Klauenglied am Ende mehr minder zahnförming verdickt; die Fühler sind ebenfalls wesentlich kürzer; die Stellung dieser Arten zu *Metriona* wurde daher auch schon bisher ungerechtfertigt gewesen sein. Bei dieser Sachlage erscheint es wohl am zweckmässigsten, im Sinne des von Herrn S. Maulik [1] gemachten Vorschlages, die Gattungen

[1] Fauna Brit. Ind., Cassid. (1919) 363.

Coptocycla und *Metriona* künftig für nicht-amerikanishche Arten überhaupt nicht mehr anzuwenden, sondern solche Arten, insoweit sie nicht in eine andere Gattung schon jetzt eingereiht werden können, in der polymorphen Gattung *Cassida* bis zu ihrer definitiven systematischen Gliederung zu führen.

Cassida basilana sp. nov.

♀ : Ovato-rotundata, valde convexa, nitida, laete flava, marginibus basalibus prothoracis elytrorumque, sutura, punctis duobus transversim positis prothoracis maculisque utrinque quinque parvis elytrorum nigropiceis, nempe duabus in basi, oblongis, obliquis, duabus mediis in disco, ultima in disco exteriore parum pone medium; prothorax subtriangularis, antice perparum, basi valde rotundatus, angulis ante medium sitis, subrotundatis, disco laevi; elytra prothorace dimidio latiora, basi sat emarginata, angulis humeralibus parum obtusis, lateribus modice ampliatis, disco convexo, seriato punctato, interstitiis latis, planis, laevibus, protecto subdeplanato, laevi 8.75 × 7.5 mm.

Exemplar unicum in insula Basilan Philippinarum a domine Ch. F. Baker detectime in mea collectione conservatum est.

Lebhaft gelb, zwei kleine Flecke nebeneinander auf der Scheibe und der Hintersaum des Halsschildes bis über die Ecken, die Basis der Flügeldecken bis zu den Schulterecken schmal pech schwarz; ebenso die Naht bis zur Spitze mit einer schwachen Verbreiterung an der Höckerstelle; dieselbe Farbe haben fünf Flecke auf jeder Decke, die als Reste einer ausgedehnteren dunklen Zeichnung verblieben sind und vielleicht nicht konstant sein dürften; zwei an der Basis, beide oblong und schräg nach aussen gerichtet, der äussere auf der Schulterbeule, der zweite am Beginn der nächsten Punktreihe; dann zwei in der Mitte, hievon der vordere im Hauptgrübchen, punktförmig, der zweite gleich hinter ihm, grösser, unregelmässig gestaltet; der fünfte Fleck auf dem vorletzten Zwischenraum unmittelbar nach der Seitendachbrücke. Fühler und Unterseite einfarbig gelb, etwas gesättigter als die Oberseite.

Eiförmig gerundet, kaum ein viertel länger als breit, hoch und gleichmässig gewölbt, ohne Bruch der Profillinie. Kopfschild trapezförmig, etwas kürzer als breit, mit dreieckigem, schwach gewölbtem, fast glattem Mittelstück und feinen, vorne von den Augen sich entfernenden Stirnlinien, die im Bogen zusammenlaufen. Die Fühler mässig lang, wenig über die Halsschildecken reichend, aussen schwach verdickt, das zweite Glied kugelig, das dritte doppelt länger als das zweite und um ein Viertel kürzer

als das vierte, mit dem fünften gleichlang, die äusseren ziemlich kurz, nur um die Hälfte länger als dick. Halsschild um die Hälfte breiter als lang, subtriangulär, vorne kaum, hinten stark gerundet, mit weit vorne gelegenen, ziemlich kurz verrundeten Ecken; die Scheibe stark glänzend, glatt. Schildchen dreieckig. Flügeldecken an der Basis tief ausgerandet, so dass die wenig abgestumpften Schulterecken in einer Querlinie mit den Halsschildecken liegen, die Seiten wenig erweitert, das Ende ziemlich spitz zugerundet, die Scheibe hoch gewölbt, im Basaldreieck kaum eingedrückt, mit mässig feinen Punktreihen, die hinten fast verlöschen und in denen die Abstände, in welchen sich die Punkte folgen, viel grösser sind als die Punkte selbst; der Randstreif ist viel tiefer, durch eine hochgewölbte Seitendachbrücke lange unterbrochen; die Zwischenräume sind vielmal breiter als die Punktreihen, glatt, der letzte um die Hälfte breiter als die anderen. Prosternum breit, mit stark erweitertem Fortsatz. Die Klauen glatt, mit einer sehr stumpfen, zähnchenförmigen Erweiterung an der Basis. Das letzte Sternit hinten weit und sehr seicht ausgerandet, fein körnig gerunzelt (sexuelles Merkmal!).

Am nächsten mit *C. dysphorica* Spaeth [2] verwandt, wesentlich grösser und schmäler, hinten viel mehr zugespitzt (Weibchen!), höher gewölbt, der Halsschild subtriangulär, mit viel weiter vorne gelegenen, kürzer verrundeten Ecken und weniger gebogenem Vorderrand, die Schulterecken stärker vorgezogen, die Seiten der Flügeldecken weniger erweitert, die Punktreihen schwächer und viel weniger dicht besetzt, die Zwischenräume breiter, die Seitendachbrücke viel höher und kräftiger. Die Fühler sind dicker, verhältnismässig kürzer, das siebente bis zehnte Glied nur um die Hälfte länger als dick, während sie bei *dysphorica* mehr als doppelt so lang sind; der Klauenzahn ist stumpfer und schwächer. Von *dysphorica,* welche Herr Ch. F. Baker auf Luzon auf dem Mount Maquiling, und auf Mindanao bei Butuan gesammelt hat und die mir sonst noch von Manila (Simon), Mindanao, den Molukken, und Celebes vorliegt, hat Herr Baker ein Stück (No. 6098) in Baguio, Benguet, gesammelt, bei welchem die bindenartige Zeichnung der Flügeldecken fast wie bei der früher beschriebenen *basilana* reduziert ist; es sind nur die zwei strichförmigen Basalflecke, eine Makel im Basaldreieck, und sechs oder sieben teilweise verbundene Flecke auf jeder Scheibe pechbraun.

[2] Ann. Mus. Nat. Hung. 15 (1919) 201.

DIE TENEBRIONIDEN (COLEOPTERA) DES INDO-MALAYISCHEN GEBIETES, UNTER BERUECKSICHTIGUNG DER BENACHBARTEN FAUNEN, IV

DIE GATTUNGEN PHLOEOPSIDIUS, DYSANTES, BASANUS, UND DIAPERIS

Von Hans Gebien

Hamburg, Germany

EINE TAFEL

Subfamilia DYSANTINÆ nova

Das Fehlen einer Gelenkhaut zwischen den letzten Abdominalsegmenten bei den Tenebrioniden ist ein Merkmal von hohem systematischem Wert, das geeignet ist ganze Unterfamilienreihen von einander zu trennen. Es ist daher seit Leconte und Horn von allen Systematikern mit Erfolg zur Einteilung der schwierigen Familie der Tenebrioniden verwandt worden. Umsoweniger lässt sich auf dieses Charakteristikum verzichten, als in dieser Familie an wirklich durchgreifenden Merkmalen grosser Mangel ist. Charaktere, die wo anders Familien trennen, haben hier oft nur den Wert von Gattungsmerkmalen. Die Boletophagiden rechnete man bisher zu den Unterfamilien mit Gelenkhaut zwischen den letzten Abdominalsegmenten. Kein Autor scheint aber die exotischen Gattungen auf die Richtigkeit dieser Angabe nachgeprüft zu haben. Eine Durchsicht der mir bekannten Gattungen ergibt aber die interessante Tatsache, dass verschiedene von ihnen einer Gelenkhaut ermangeln. Das sind die folgenden: *Dysantes* Pascoe, *Calymmus* Pascoe, *Ozolais* Pascoe, *Mychestes* Pascoe, *Orcopagia* Pascoe, *Glyxerus* Pascoe, und *Phloeopsidius* g. nov.

Genus **PHLOEOPSIDIUS** novum [1]

Gestreckt, flach, geflügelt. Körper sehr rauh. Kopf lang, vor den Augen stark entwickelt, die Augen sind kreisrund,

[1] *Endophloeus flexuosus* Solander ist durch Lacordaire in die Gattung *Boletophagus* gekommen, mit der sie kaum Verwandtschaftsbeziehungen hat. Es ist vielmehr eine neue Gattung darauf zu gründen, die ich *Phloeopsidius* nenne.

halbkugelig gewölbt, und werden durch die Wangen nicht eingeengt, diese gehen vielmehr, sich nach hinten verengend, am Innenrand der Augen als hocherhabene Augenfalten weiter, vorn sind sie winklig und so breit wie die Augen. Die Oberfläche ist sehr uneben, das Epistom ausserordentlich lang, stark gewölbt, der Quereindruck breit und tief, der Vorderrand ist gerade abgestutzt. Fühler mässig lang, 11-gliedrig, am Grunde dünn, Glied 3 verlängert, am Ende befindet sich eine stark abgesetzte, 3-gliedrige, knopfartige Keule deren Glieder frei sind. Das Mentum ist quadratisch, flach, die Seitenlappen des Submentums sind stark schwielig erhaben, schräg abgestutzt, und lassen zwischen sich und dem Auge eine schmale aber deutliche Fühlerfurche, das Endglied der Maxillarpalpen ist sehr kurz zylindrisch, die Mandibeln sind am Ende gefurcht. Halsschild sehr uneben, mit vorragenden Vorderecken, die bis über die Augen hinaus ragen, Seiten verflacht, Basis jederseits neben den Hinterecken ausgeschnitten, Seitenrand krenuliert, Schildchen erhaben, quer. Flügeldecken mit knotigen Längserhabenheiten, krenulierten Seitenrand, und vollständigen, bis zum Ende gleichbreiten Epipleuren. Unterseite flach, Prosternum hinten gesenkt, vorn sehr lang, flach, Mesosternum schwach abschüssig, nicht eingedrückt. Abdominalsegmente mit scharfkantigen und gefalzten Hinterrändern der Segmente, ohne sichtbare Gelenkhaut. Beine sehr kurz, Schenkel unten ungekantet, Schienen ungekielt.

Typus dieser chilenischen Gattung ist *Endophloeus flexuosus* Solander, eine Art die der Autor in die europäische *Colydiden*-Gattung stellte, mit der sie in der Tat Aehnlichkeit hat. Lacordaire weist ihre Zugehörigkeit zu den Boletophagiden nach. Hier stand sie bisher bei *Boletophagus*, der gar keine Beziehungen zu ihr hat: Kopf, Augen, Fühler, und Mundteile trennen sie weit. Eine zweite hierher gehörige Art ist *Endophloeus angustatus*.

Dagegen gehört *Boletophagus costulatus* Fairmaire aus Chile zu den Boletophagiden, unterscheidet sich aber von *Boletophagus* durch fest auf der Stirn eingelenkte Fühler, ganz nach aussen gerichtete Wangen und kugelige erste Fühlerglieder.

Genus **DYSANTES** Pascoe

Dysantes PASCOE, Ann. & Mag. Nat. Hist. IV 8 (1871) 348.

Die Beschreibung der Gattung bei Pascoe ist nicht schlecht, doch bedarf sie in Rücksicht auf die zahlreichen seither beschriebenen Gattungen von Boletophagiden einiger Ergänzungen.

Körper geflügelt, lang zylindrisch, oben schwach depress. Kopf ungehörnt, Augen ungeteilt, Wangen knotig aufgeworfen, kurz eckig vor die Augen tretend. Epistom gerade abgestutzt, Schläfen dick hinter den Augen liegend, Hinterkopf plötzlich zu einem Hals verengt. Fühler am Grunde sehr dünn, 11-gliedrig, mit stark abgesetzter 3-gliedriger Keule. Mentum ungekielt, gewölbt, Endglied der Maxillarpalpen schwach dreieckig, Mandibeln tief gefurcht, eine Kehlfurche fehlt, statt ihrer findet sich ein querer Eindruck. Pronotum vorn mit langen, wagerechten Hörnern in beiden Geschlechtern, durch körnige Leistchen uneben, die Seiten schwach verflacht, scharf gekantet, krenuliert, Basis stark doppelbuchtig. Flügeldecken mit starken Schultern und vollständigen, wenn auch schmalen, Epipleuren. Prosternum vorn gut entwickelt, hinter den Hüften wagerecht, Vorderhüften kugelig, Mesosternum mit vorragenden Ecken, Metasternum sehr lang. Abdomen ohne sichtbare Gelenkhaut zwischen den vorletzten Segmenten. Beine dünn und ziemlich lang, Schenkel körnig rauh, Schienen schwach gebogen, zur Spitze verjüngt, ohne Endecke, ungekielt, Tarsen dünn.

Es sind bisher drei Arten bekannt geworden. Es scheint mir aber als ob nur zwei anzunehmen sind, von denen die eine auf Java, die andere auf Ceylon vorkommt. Die erste hat den Namen *D. elongatus* Redtenbach zu führen, unter diesem Namen ist das Männchen beschrieben, während Pascoe das Weibchen als *D. taurus* beschreibt.

Dysantes elongatus Redtenbach.

Dysantes elongatus Redtenbach, Reise der Oesterr. Freg. Novara um die Erde, Wien (1867–1868) 127, t. 4, f. 4.

Dysantes taurus Pascoe, Ann. & Mag. Nat. Hist. IV 8 (1871) 349, Weibchen.

Das Weibchen unterscheidet sich vom Männchen durch die Gestalt der Prothoracalhörner, die bei ihm leierförmig und viel länger und dünner als die einfach nach innen gekrümmten Hörner des Weibchens; ferner zeigen die ersten Abdominalsegmente einen Flaum feiner Haare, die dem Weibchen fehlen; der Penis ist sehr zart.

Java (meist ohne genauere Angaben); Toegoe (*Pasteur*) nach Gravely [2] auch von Tenasserim; Sukli, 2,000 Fuss.

In den Sammlungen Leyden, Stettin, Berlin, und Hamburg.

[2] Rec. Ind. Mus. VIII 8 (1915) 523.

Dysantes biluna Walker.

Dysantes biluna WALKER, Ann. & Mag. Nat. Hist. III 2 (1858) 284.

Von dieser Art liegen mir nur zwei Weibchen vor. Sie ist der vorigen täuschend ähnlich, doch ist sie kleiner (8 statt 10 Millimeter), die Skulptur ist rauher, die vorletzten Fühlerglieder sind nur 1.5 mal so breit wie lang (bei der vorigen doppelt so breit), ferner sind die Hörner innen am Grunde verflacht, scharfkantig und ohne Wimpern, bei *elongatus* fast rund, viel dünner und mit feinen Wimpern versehen.

Ceylon (*Nietner*). Peradeniya (*Horn*).

In den Sammlungen Dahlem und Berlin.

Beide Arten scheinen selten zu sein, mir liegen nur wenige Stücke vor.

DIAPERINÆ

SYSTEMATISCHES

Diese dritte grosse Unterfamilie der pilzfressenden Tenebrioniden ist im indo-malayischen Gebiet vorzüglich vertreten, besser und besonders mannichfaltiger als in irgend einer andern Fauna. Der Zahl der Arten nach, besonders aus der Gattung *Platydema* und *Hoplocephala* übertrifft allerdings Amerika unsere Fauna. Leider ist die Unterfamilie in systematischer Beziehung ganz ungeklärt. Es ist bis jetzt nicht gelungen, ein durchgreifendes Merkmal zu finden, das die Diaperinen in ihrer Gesamtheit von den übrigen Tenebrioniden abtrennt. Die bisherige Umgrenzung der Unterfamilie, wie sie Lacordaire gibt, kann unsern Ansprüchen nicht genügen. Er hat nur einen kleinen Teil der jetzt bestehenden Gattungen gekannt (acht von vierzig), ausserdem macht er den alten Autoren zuviel Zugeständnisse. Es würde hier zu weit führen, wenn ich auf die verschiedenen Systeme einging, welche die Entomologen der verschiedenen Länder über die Tenebrioniden ausarbeiteten. Fast alle Bearbeiter erkennen Lacordaire an und übernehmen in seinem Sinne die Unterfamilie der Diaperinen. Erst Reitter hat ganz neuerlich in seinen Bestimmungsschlüssel für die Unterfamilien der Tenebrioniden die Diaperinen aufgeteilt. Er nimmt zwei Unterfamilien an: Diaperinæ mit den Gattungen *Diaperis, Hoplocephala,* und *Pentaphyllus;* und Platydeminæ mit *Platydema, Scaphidema, Alphitophagus,* und *Metaclisa.* Beide scheiden sich durch die Länge des ersten Gliedes der Hintertarsen. Ich kann leider diese Einteilung für die asiatischen Gattungen nicht anerkennen, es gibt bei *Hoplocephala* und auch in andern Gattungen Arten von denen man nicht wüsste welcher Unterfamilie man

sie zurechnen sollte. Auch das Merkmal "eine Gelenkhaut zwischen Oberlippe und Epistom ist vorhanden,"das beiden Gruppen zukommen soll, trifft bei *Menimus* und *Labidocera* nicht zu, bei einigen andern (zum Beispiel *Scaphidema* und *Ischnodactylus*) ist die Haut undeutlich oder fehlt. Es ist daher besser auf dieses zweifelhafte Kriterium zu verzichten.

Es dürfte vielleicht empfehlenswert sein, die Unterfamilie auf alle Gattungen zu beschränken die eine fein krenulierte, scharfe Kante an den Schienen hinten haben. Dieses Merkmal ist bisher ganz übersehen. Im Zweifelfalle sollte das den Ausschlag geben. Ich rechne daher *Basanopsis,* die glatte Schienen hat, zu den Ulomiden, wo sie in die nächste Nähe von *Diaclina* kommt.

Eine neue Einteilung der verwandten Unterfamilien zu versuchen ist hier nicht der Platz; sie müsste alle Gattungen der Welt berücksichtigen und nicht nur die wenigen Gattungen einer Fauna umfassen. Ich fasse also hier, rein aus Zweckmässigkeitsgründen, die Diaperinen im alten Umfange, trotzdem ich die Unzulänglichkeiten der Lacordaire'schen Einteilung wohl kenne.

Ausser den in der Tabelle ausgewiesenen Gattungen sind im Coleopterorum Catalogus noch eine Anzahl anderer Gattungen in diese Unterfamilie gestellt. Eine Prüfung ergab aber dass sie nicht hineingehören. Das sind die folgenden:

Metaclisa gehört zu den Halopiden.
Tetragonomenes und *Addia* sind mir unbekannt; sie gehören wahrscheinlich zu den Cnodaloniden.
Hemicera ist eine Cnodalonide und aufs nächste mit *Eucyrtus* verwandt. Viele als *Eucyrtus* beschriebene Arten gehören zu ihr.
Diphyrrhynchus ist eine Pedinide.
Derispia ist eine Leiochride.
Basanopsis ist eine Ulomide.

Von den noch verbleibenden oder neu errichteten Gattungen stehen allerdings einige besser isoliert, da auffällige, wichtige Merkmale sie von allen andern Diaperiden unterscheiden. So hat *Labidocera* nicht nur abenteuerlich gestaltete Fühler, sondern auch offene Gelenkhöhlen der Vorderbeine. Auch *Menimus* und *Enanea,* mit nur 10-gliedrigen Fühlern und bedornten Sohlen der hinteren Füsse und winzigen Augen, können wohl Anspruch auf einen eigenen Platz erheben.

GEOGRAPHISCHE VERBREITUNG

Manche Gattungen dieser Unterfamilien sind ausserordentlich weit verbreitet. Ja, wenn wir die Ulominen wegen ihrer vielen, durch den Handel verschleppten kosmopolitischen Arten

ausnehmen, ist es diese Unterfamilie welche die meisten sehr weit oder über alle Erdteile verbreiteten Gattungen enthält. In der Tabelle weiter unten werden dreizehn Diaperiden-Gattungen fur das indo-malayische Gebiet angenommen. Von diesen sind nur vier auf das Gebiet, im weitesten Sinne genommen, also mit Einschluss von Japan, Südchina, und Celebes, beschränkt: *Labidocera, Basanus, Anisocara, Ischnodactylus.* Nur Zwei Gattungen, *Labidocera* und *Anisocara,* sind lokal; die andern beiden sind weit verbreitet. Von den andern neun Gattungen sind:

Platydema und *Hoplocephala,* über alle Weltteile verbreitet.
Diaperis und *Scaphidema,* über Europa, Asien, und Amerika.
Pentaphyllus, über Europa, Asien, Afrika, und auf den Inseln des stillen Ozeans (eine neue Art, in den Sammlungen Hamburg und Gebien).
Ceropria, im australianischen, papuanischen, indo-malayischen, und afrikanischen Gebiet.
Martianus, im papuanischen und asiatischen Gebiet und Ostafrika nebst Inseln.
Spiloscapha, im australianischen und indo-malayischen Gebiet.
Menimus, in Neu-Seeland und im indo-malayischen Gebiet.

Die Arten allerdings sind nie so weit verbreitet, so finden wir keine kosmopolitische Art bei den Diaperiden, wohl aber einige die im ganzen indo-malayischen Gebiet bis ins papuanische vorkommen; so *Martianus dermestoides, Platydema malaccum,* und *P. tricuspis.* Ausserdem sind auch eine Anzahl Arten von *Platydema* innerhalb des Gebietes sehr weit verbreitet; zum Beispiel, *P. subfascia, P. waterhousei, P. pallidicolle, P. marseuli.*

Die Diaperinen sind, wie es scheint, ausschliesslich an Baumschwämme gebunden. Zur Erklärung ihrer geographischen Verbreitung ist es daher nötig die Wirtspilze und ihre Verbreitung zu kennen. Leider ist nicht ein einziger Wirtspilz bekannt. Nur Eichelbaum gibt für einige afrikanische Arten den Pilz *Fomes nigrolaccatus* an. Auch Angaben darüber, ob die Tiere monophag sind, fehlen gänzlich.

Als Wirtspilze für die pilzfressenden Tenebrioniden, die Boletophaginen und Diaperinen, dürften die Gattungen *Polyporus* und *Fomes* hauptsächlich wenn nicht allein, in betracht kommen. Nun sind diese Gattungen, wie bekannt, beide in allen Weltteilen verbreitet. Schon das allein erklärt die Verbreitung der Diaperinen and Bolitophaginen. Eine Durchsicht der Pilzbände von Engler and Prantl, "Natürliche Pflanzenfamilien," ergibt aber die überraschende Tatsache, dass auch sehr viele Arten der genannten Gattungen eine ausserordentlich weite Verbreitung haben. Es würde hier natürlich zu weit führen, wenn ich die

Gebien).

weit verbreiteten Baumschwämme alle anführe, aber ich möchte mir nicht versagen, wenigstens für einige Arten, besonders soweit sie auch im indo-malayischen Gebiet vorkommen, die Verbreitung anzugeben:

Fomes obliquus Pers., Europa, Nord- and Südamerika, Westindien, Afrika, Ceylon, und Australien.
Fomes rufoflavus B. and C., Malacca, Borneo, Cuba, Zentralamerika.
Fomes pectinatus Klotzsch, Europa, Nordamerika, Australien, Java, Philippinen, India Oriental, und Afrika.
Fomes amboinensis (Lam.) Fr., an Stämmen in fast allen Tropenländern häufig.
Fomes gibbosus Nees, in Java und Australien.
Polyporus auberianus Mont., Südamerika, Westindien, Australien, tropisches Afrika, und Neu-Guinea.
Polyporus plebejus Berk., Brassilien, India Oriental, und Neu-Seeland.
Polyporus betulinus Bull., Europa, Sibirien, und Nordamerika.
Polyporus gilvus Schwein., Nord- and Südamerika, Westindien, Afrika, Australien, Neu-Guinea, Malayisches Archipelago, und Ostindien.
Polyporus cupreus Berk., Ostindien, Australien.
Polyporus tabacinus Mont., Chili, Neu-Seeland, Java, und tropisches Afrika.

Ob diese Pilze als Wirte für die Tenebrioniden inbetracht kommen muss genauere Prüfung zeigen. Mir schien diese kleine Auswahl aus einem gewaltigen Gebiet interessant genug.

Von hervorragendem Interesse und näherer Betrachtung wert ist das Auftreten zweier Gattungen, die wir bisher nur von Australien, respektiv Neu-Seeland, kennen. Die eine ist *Menimus,* von der alle Arten bis auf eine recht abweichende aus Japan, von Neu-Seeland bekannt sind.[3] Ich kenne keine zweite Gattung die eine ähnliche Verbreitung zeigt. Die hier neu beschriebenen Arten *kraepelini* and *rugicollis* sind aber den neu-seeländischen sehr ähnlich. Es sind also zwei Verbreitungszentren bekannt; das indo-malayisch-japanische und das neuseeländische. Im ganzen, dazwischen liegenden australischen und papuanischen Gebiet scheint sie zu fehlen. Auf Neu-Kaledonien wird sie durch die verwandte Gattung *Parta* vertreten. Ich wage nicht, Zusammenhänge aus vorzeitlichen Erdperioden zu konstruieren, sondern möchte allein die an sich schon interessante Tatsache feststellen. Es soll besonders betont werden dass es sich nicht um eine Gattung handelt die mit zahlreichen andern verwandt ist, so dass also eine äussere Aehnlichkeit für

[3] Doch liegt mir die Gattung jetzt aus Mjöbergs Ausbeute aus Australien vor, und zwei Exemplare einer neuen Art aus Neu-Guinea (Britisches Museum).

Verwandtschaft genommen werden kann. Die Gattung ist vielmehr durch zahlreiche Merkmale so ausgezeichnet, dass sie ganz isoliert steht (zum Beispiel, winzige Augen, 10-gliedrige Fühler, Dörnchen an den Sohlen, etc.).

Recht eigentümlich ist übrigens auch das Vorkommen der australischen Gattung *Spiloscapha* auf Java, unter Uebergehung des papuanischen Gebietes. Doch steht dieses Vorkommen nicht vereinzelt da. Ich erinnere an die Gattungen *Cossyphus, Menephilus, Byrsax,* und *Trachyscelis,* die alle in Australien und im indo-malayischen Gebiet heimisch sind, aber das papuanische, wie es scheint, meiden. Uebrigens ist *Spiloscapha* mit der weit verbreiteten Gattung (Europa, Nordasien, Nordamerika) *Scaphidema* so nahe verwandt, dass einer Vereinigung beider kaum etwas im Wege stehen dürfte.

SEXUELLER DIMORPHISMUS

Auch bei vielen Diaperiden, ebenso wie bei den Boletophagiden, sind die Geschlechter oft in beträchtlichem Masse verschieden. In der Gattung *Ceropria,* innerhalb der Unterfamilie bei dieser Gattung allein, sind die Vordertarsen der Männchen, meist auch die Mitteltarsen, erweitert. Dieses Merkmal, das auch zum Beispiel bei sehr vielen Caraben auftritt und geeignet ist ganze Unterfamilienreihen zu trennen, hat bei den Tenebrioniden nicht immer so hohen systematischen Wert. Zwar kommt es allen Gattungen der Pediniden ohne Ausnahme zu, die dadurch allein von allen Opatriden geschieden werden können; aber in andern Unterfamilien kommt es nur vereinzelten oder der Mehrzahl der Gattungen zu. Erweiterte Vordertarsen treten zum Beispiel auch bei einigen Gattungen der Ulomiden, Tenebrioniden, Amarygmiden, und Strongylien, und bei vielen Gattungen der Helopiden und Cnodaloniden vor. Da die erweiterten Tarsen vermutlich bei der Begattung eine Rolle spielen, sind sie, im Gegensatz zu den Kopfhörnern, fast nie individuellen Schwankungen unterworfen.

Ich habe schon bei der Unterfamilie der Boletophagiden ausgeführt, dass die sogenannten sekundären Geschlechtsmerkmale nicht gleichwertig sind. Die Kopf- und Prothoracalhörner sind bei Käfern, da sie nicht direkt in den Dienst der Begattung gestellt werden, in hohem Masse individuellen Schwankungen unterworfen. Vielleicht liegt die Sache bei *Labidocera* anders. Hier handelt es sich, nicht wie bei den Kopfhörnern anderer Insekten, um starre Auswächse des Chitinskeletts, sondern um bewegliche

Haken; es sind nämlich die ausserordentlich verlängerten, hakenförmigen ersten Fühlerglieder welche ein Horn bilden. Es ist möglich dass sie bei der Begattung, etwa zum Festhalten, eine Rolle spielen. Demnach müssten diese falschen Hörnchen zu den beständigen Gebilden gestellt werden. Bei den vier mir vorliegenden Männchen sind sie in der Tat ganz gleichartig, während zum Beispiel bei den gehörnten *Platydema* kaum zwei ganz gleiche Männchen gefunden werden. In sehr vielen Fällen ist das Männchen äusserlich vom Weibchen nicht mehr zu unterscheiden, denn auch in diesem Geschlecht kommen, wenn auch nicht Hörner, so doch scharfeckige Vorragungen auf dem Kopf vor (*P. marseuli*, zum Beispiel). Die Hornbildung beginnt mit kleinen rundlichen Tuberkeln, die allmählich höher werden.

Bei den fünf Gattungen *Platydema, Ischnodactylus, Hoplocephala, Pentaphyllus,* und *Anisocara* jedoch sind die Hörner auf dem Kopf nicht nur individuell in der Grösse sehr verschieden, sondern auch von Art zu Art, von Gattung zu Gattung in der Anlage anders. Auch da bieten die Diaperiden eine Mannichfaltigkeit, wie sie sonst innerhalb einer und derselben Gruppe von Insekten wohl kaum wieder vorkommen dürfte. Es finden sich ein, zwei, drei, oder vier Hörner auf dem Kopf; das eine Horn ist entweder einfach konisch, oder bis zum Grunde tief gespalten, also gabelförmig. Wesentlich mannichfacher tritt die Bewaffnung auf, wenn zwei Hörner vorhanden sind; sie sind einfach, kräftig, etwas dreieckig, oder lang, dünn, parallel, oder ausserordentlich lang, riemenförmig, und stark zum Kopf gebogen, also über diesem halbkreisförmig liegend, oder sie sind asymmetrisch, wie weiter unten ausgeführt und zwar wieder in grundsätzlich verschiedener Weise; sie sind nackt oder behaart, und in diesem Fall entweder einfach oder mit einem sehr langen Pinsel am Ende; sie stehen in verschiedener Richtung auf dem Kopf, sind parallel, konvergieren, divergieren, oder kreuzen sich (*Ischnodactylus mirabilis*), sind nach vorn gerichtet, stehen senkrecht oder zeigen nach hinten. Ich glaube nicht, dass irgendwo anders im Tierreich eine derartige Mannichfaltigkeit besteht. Alle Hörner der Diaperiden, wenigstens der Asiaten (bei den Afrikanern macht *Gargilius* eine Ausnahme), stehen auf dem Kopf. Sie entspringen konstant, entweder aus dem Nacken (*Ischnodactylus* und einhörnige *Platydema*) oder stehen zwischen den Augen, wie bei den meisten zweihörnigen Arten, oder auf dem Clypeus (bei *Pentaphyllus biconiger*), oder am Vorderrand des Epistoms (bei den drei- und vierhörnigen Arten).

Ob diese Hornbildungen im Kampf der Geschlechter eine Rolle spielen oder ein Schmuck sind, wage ich nicht zu entscheiden. Gegen das erstere sprechen mehrere Bedenken: die haarfeinen Hörner vieler *Ischnodactylus*-Arten, die überdies an der Spitze einen Haarpinsel tragen und wieder fast das Epistom berühren, sind wohl kaum Waffen, auch die starke Asymmetrie bei *Platydema*-Arten ist sicher bei der Anwendung der Hörner im Kampf um das andere Geschlecht störend.

Asymmetrie.—Wie schon oben erwähnt, sind eine Anzahl Arten von *Platydema*, ebenso *Anisocara*, am Kopf des Männchens asymmetrisch gebaut. Diese Bildung ist von hohem Interesse und verdient besondere Erwähnung, denn sie ist ganz konstant, findet sich also bei allen männlichen Individuen der betreffenden Arten, ist nur weniger auffällig wenn die Hornbildung bei den Tieren mangelhaft entwickelt ist. Die Asymmetrie findet sich bei vielen der gefleckten Arten von *Platydema*, ferner bei *haemorrhoidalis*. Es ist nun konstant bei einigen Arten das linke Horn stark entwickelt, das rechte verkümmert, bei anderen das rechte normal, das linke reduziert. Uebrigens haben auch *Platydema* anderer Faunengebiete eine ähnliche Erscheinung: so *P. aries* aus Australien und *P. tricornutus* aus Madagaskar. Nun kommen, wenn auch nur vereinzelt, asymmetrische Bildungen auch bei andern Insekten vor. Fast immer aber sind es die Mandibeln, welche Ungleichheit zeigen, zum Beispiel bei *Hister inaequalis*, bei der Carabidengattung *Anthia*, ferner bei mehreren Wespen, Ameisen, und Termiten. Recht auffällig sind einige Brenthiden-Gattungen in dieser Beziehung. Hier aber sind es die Hörner auf dem Kopf des Männchens die ungleich sind. Ich kenne kein Gegenstück zu dieser Erscheinung. Bei gewissen Crustaceen sind es die Vorderbeine bei welchen sich die Asymmetrie ausprägt.

ZEICHNUNG

Im Gegensatz zu den Boletophaginen, die sich durch ein auffällig rauhes Hautskelett auszeichnen, sind die Diaperinen ganz glatt, nur einzelne leicht behaart. Ausserdem sind nicht wenige Arten unserer Unterfamilie gezeichnet, dagegen nicht eine Art der Boletophaginen. Gezeichnet oder gefleckt sind viele *Platydema*-Arten, alle Arten von *Diaperis* und *Basanus*, die meisten *Ischnodactylus*-Arten, ferner *Spiloscapha*, einzelne *Pentaphyllus*- und *Ceropria*-Arten. Die Zeichnung besteht fast immer in gelblichen oder roten Flecken und Binden auf dunklem, nicht metallischem Grunde. Bei den meisten Arten von *Ceropia* sind auf

metallischer Oberseite prachtvoll irisierende Flecken vorhanden und zwar meist ein Schulter- und ein Spitzenfleck.

Man ist im allgemeinen, und zwar mit Recht, geneigt die Zeichnung oder Fleckenbildung bei Käfern als ein Merkmal von geringem specifischen Wert anzusehen, denn sie sind selten beständig. Ich erinnere nur an die Zeichnung der Cicindelen, Coccinelliden, gewisser Chrysomeliden, Erotyliden, und Zonabris-Arten. Natürlich ist eine gewisse Gesetzmässigkeit in dem Schwinden und Zunehmen der Zeichnung vorhanden; auch die Anordnung ist fast immer an bestimmte Regeln gebunden, die für die einzelnen Arten leicht festzulegen sind. Bei den meisten Tenebrioniden dagegen ist die Zeichnung recht beständig, und das trifft besonders für die indo-malayischen Diaperinen zu (manche amerikanische Arten dagegen sind ungemein variabel). Natürlich kommen auch hier geringe Schwankungen vor, die sich besonders in der Grösse der Flecken und Binden zeigen. Im übrigen aber kommt bei unseren Käfern der Färbung ein ziemlich hoher systematischer Wert zu. Das geht besonders daraus hervor, dass die Färbung die Skulptur beeinflusst, und das geschieht in doppelter Weise:

a. In seltenen Fällen (einige *Basanus*-Arten) sind die Decken nicht vollkommen flach, sondern auf den Flecken leicht schwielig erhaben. Eine ähnliche Erscheinung finden wir bei manchen Erotyliden.

b. Häufiger, besonders bei fast allen *Ischnodactylus*-Arten, aber auch bei einzelne *Platydema*, sind die Hauptzwischenräume 3, 5, zuweilen auch 7, auf den Flecken, besonders der vorderen Binde, auf Kosten der anderen Interstitien (2, 4, 6) verbreitert. Die genannten Streifen sind wie bekannt entstehungs-geschichtlich auf die Hauptadern der häutigen Vorderflügel anderer Insekten zurückzuführen.[4] Wäre nicht eben diese Verbreiterung auf den Querbinden vorhanden, so würde von Hauptrippen bei *Ischnodactylus* und *Platydema* nicht die Rede sein können, denn im übrigen sind die Zwischenräume nicht abwechselnd breiter oder erhabener.

c. Bei Arten mit stark gezackten Querbinden (sehr auffällig zum Beispiel bei der afrikanischen Diaperiden-Gattung *Gargilius*, aber auch bei *Ischnodactylus* mit Binden oder mit sehr kleinen Flecken), schwach und wenig deutlich bei den gezeichneten *Platydema*, wird der Vorrang, den die Hauptrippen gegenüber den andern haben, dadurch festgelegt dass die Zacken sich

[4] Kolbe, H. J., Einführung in die Kenntnis der Insekten, 257 ff.

gerade in ihnen befinden, und auf ihnen nach vorn oder hinten gehen.

Bestimmungstabelle für die asiatischen Diaperinen-Gattungen.

1. Fühler 11-gliedrig, Tarsen unten einfach behaart, Augen meist gross, Oberlippe vom Epistom meist durch eine deutliche Gelenkhaut getrennt ..... 2.
   Fühler 10-gliedrig, Tarsen zottig behaart und in der Behaarung unten mit Dörnchen, Augen winzig klein, zwischen Oberlippe und Epistom keine Gelenkhaut ..... **Menimus** Sharp.[5]
2. Gelenkhöhlen der Vorderhüften hinten offen, das erste Fühlerglied in beiden Geschlechtern stark verlängert, beim Männchen einen riesigen Haken bildend, Augen sehr klein, Flügeldecken verworren punktiert ..... **Labidocera g. nov.**
   Gelenkhöhlen der Vorderhüften geschlossen, das erste Fühlerglied klein, normal, Augen gross oder sehr gross, Flügeldecken (Ausnahmen *Pentaphyllus* und einige *Basanus*-Arten) mit reihiger Punktierung..... 3.
3. Die Wangen engen die Augen kaum ein, diese kugelrund, Mittelbrust bis zur Hinterbrust eingedrückt und vertieft, Flügeldecken verworren punktiert (bei *strictus* gefurcht)..... **Pentaphyllus** Latreille.
   Die Wangen schnüren die Augen tief ein, Mittelbrust vorn ausgeschnitten oder eingedrückt, aber hinten mit der Hinterbrust in gleicher Ebene liegend. Flügeldecken gereiht punktiert oder gestreift, oder doch (bei *Basanus*) mit Spuren von Punktreihen..... 4.
4. Das erste Glied der Hintertarsen ist kaum länger als das zweite, das Prosternum ist sehr kurz und vorn senkrecht abgeschnitten und fällt ohne Rand bis zur Vorderkante ab, Endglied der Maxillarpalpen zylindrisch. Körper fast kugelig gewölbt, jede Decke vorn mit kleiner stumpfer Schwiele..... **Diaperis** Linnæus.
   Das erste Glied der Hintertarsen ist viel länger, das Prosternum fällt nicht hoch senkreckt bis zur Vorderkante ab, Endglied der Taster meist dreieckig oder etwas beilförmig, Körper flacher, oval oder fast zylindrisch, Decken im dritten oder vierten Zwischenraum ohne Schwiele ..... 5.
5. Flügeldecken an der Spitze aussen lang ausgeschnitten, Fühler dick, schnurförmig, die Glieder schlecht abgesetzt, Prosternum wagerecht, aber hinten flach, ohne senkrechten Absturz, unten am Fortsatz ausgehöhlt, Mittelbrust vorn nicht eingedrückt, Schienen ohne krenulierte Kante ..... **Basanus** Lacordaire.
   Flügeldecken an der Spitze ohne Ausschnitt, Fühler gut gegliedert, Prosternum hinten mit starkem, meist senkrechtem Absturz, Mesosternum stark eingedrückt oder augeschnitten, Schienen meist mit feiner, krenulierter Aussenkante..... 6.

[5] Von dieser Gattung dürfte *Enanea* Lewis, die beim Männchen zahnförmig aufgebogene Ecken des Epistoms und 4-gliedrige Fühlerkeule hat, kaum generisch verschieden sein.

6. Vordertarsen des Männchens erweitert, Vorder- respektiv Mittelschienen, meist beide, in diesem Geschlecht leicht geknickt, Körper fast immer mit irisierenden Metallfarben, grosse Arten umfassend. **Ceropria** Castelnau and Brulle.

Vordertarsen des Männchens nicht erweitert, Vorder- und Mittelschienen nicht geknickt, Körper selten (bei einige *Platydema*), und nie irisierend metallisch, kleine und mittelgrosse Arten umfassend ..... 7.

7. Die Schienen aussen stielrund, glatt, ohne fein krenulierten Kiel, Prosternum breit, hinten halbkreisförmig, Mittelbrust bogenförmig eingedrückt, Abdominalfortsatz sehr breit oder abgestutzt..... 8.

Schienen aussen mit fein krenuliertem Kiel,[6] Prosternum hinten schmal, spitz, Mesosternum V-förmig oder dreieckig ausgeschnitten, Abdominalfortsatz schmal und mehr oder minder dreieckig..... 9.

8. Oberseite rot- oder schwarzgelb gefleckt, Seiten des Halsschildes gerundet, Fühler vom vierten Gliede an erweitert..... **Spiloscapha** Bates.

Oberseite metallisch, doch ausserdem oft hell gefleckt, Seiten des Halsschildes trapezisch verengt, Fühler nicht vom vierten Gliede an erweitert ..... **Scaphidema** Redtenbach.

9. Körper zylindrisch, Endglied der Maxillarpalpen fast zylindrisch, Halsschildbasis fein aufgebogen..... **Hoplocephala** Castelnau and Brulle.

Körper oval (nur bei *Platydema orientalis* zylindrisch), Endglied der Maxillarpalpen dreieckig, Halsschildbasis ungerandet..... 10.

10. **Epistom** des Männchens dreieckig vorgezogen, oder stark aufgebogen, drittes Fühlerglied viel länger als das vierte..... 11.

Epistom einfach, drittes Fühlerglied selten länger als das vierte..... 12.

11. Körper sehr flach, Oberseite gezeichnet, Männchen meist mit zwei gleichen, haarfeinen, langen Hörnern im Nacken, die nach vorn gerichtet sind..... **Ischnodactylus** Chevrolat.

Körper stark gewölbt, einfarbig, etwas metallisch, Männchen mit zwei ungleichen, nach hinten gerichteten Hörnern neben den Augen. **Anisocara** g. nov.

12. Zwischen Oberlippe und Epistom fehlt eine Gelenkhaut, Körper lang, parallelseitig (Tenebrio-ähnlich), Endglied der Maxillarpalpen zylindrisch ..... **Martianus** Fairmaire.

Kopf mit deutlicher Gelenkhaut zwischen Oberlippe und Epistom, Körper mehr oder minder oval, sehr selten kurz zylindrisch, Endglied der Maxillarpalpen dreieckig ..... 13.

13. Männchen mit Porengrube auf dem Mentum, drittes Fühlerglied länger als das vierte, die folgenden selten quer, Prosternum hinten schneidig scharf und blattdünn, Körper meist auffallend flach. **Ischnodactylus** Chevrolat.

Männchen ohne Porengrube auf dem Kinn, nie mit haarförmigen aus dem Nacken entspringenden Hörnern, drittes Fühlerglied so lang wie das vierte, von diesem oder dem fünften an meist stark quer. Prosternum hinten spitz, aber nicht blattdünn. **Platydema** Castelnau and Brulle.

[6] Dieses Merkmal trifft nicht für alle Arten von *Hoplocephala* im jetzigen Sinne zu, wohl aber für alle asiatischen.

Genus **BASANUS** Lacordaire

Basanus LACORDAIRE, Genera Col. 5 (1859) 306, nota; CHEVROLAT, Compt. Rend. Soc. Ent. Belg. 21 (1878) 151.

Die Beschreibung der Gattung bei Chevrolat ist nicht schlecht, nur die der Art *forticornis* Dejean ist ganz ungenügend. Die wichtigsten Kriterien sind die sehr dicken behaarten Fühler, die am Ende aussen ausgeschnittenen Flügeldecken (daher stark verkürzten Epipleuren), das vollkommene wagerechte, hinten breite Prosternum das auf seiner Unterseite ausgehöhlt ist und dem Mesosternum vorn aufliegt.

Bei dieser Gattung kann eine brauchbare Bestimmungstabelle auf die Färbung der Decken gegründet werden, die recht konstant ist. Plastische Merkmale sind viel seltener.

1. Die ganze Oberseite hell gefärbt, Flügeldecken mit starken Punktreihen. (Philippinen.) ..... **B. misellus sp. nov.**
   Oberseite mehrfarbig oder schwarz mit Zeichnungen: Flügeldecken selten mit deutlichen Punktreihen ..... 2.
2. Decken blaugrün, mit grossem, runden Fleck vorn: Seitenrand der Decken nur an der Schulter sichtbar, mit äusserst feinen Wimperhaaren versehen. (Philippinen.) ..... **B. hellus sp. nov.**
   Decken schwarz mit Querbinde vorn, oder dort ohne Zeichnung; Seitenrand von oben ganz sichtbar, unbewimpert ..... 3.
3. Nur die Flügeldecken schwarz, der übrige Körper gelb; Zeichnungen auf den Decken fehlen, nur die Spitze rotgelb. (Celebes.) **B. celebensis sp. nov.**
   Die ganze Oberseite schwarz, nur bei *pictus* haben Kopf und Halsschild dunkelrote Flecke; Decken mit Zeichnungen ..... 4.
4. Halsschild mit roten Flecken, Spitzenfleck der Decken lang und verästelt, Schenkel mit roten Ring, grosse Art. (Borneo und Sumatra.) **B. pictus sp. nov.**
   Halsschild ganz schwarz, Spitzenfleck rund oder quer, Schenkel schwarz ..... 5.
5. Der Spitzenfleck ist sehr gross, von ein Drittel der Deckenlänge, und lässt nur den Nahtstreif schwarz. (Java.) ..... **B. apicalis sp. nov.**
   Der Spitzenfleck ist sehr klein, rundlich ..... 6.
6. Das Abdomen ist rot oder rotgelb, Fühlerglieder quadratisch, Schläfen schwach eingeschnürt ..... 7.
   Das Abdomen ist schwarz, Fühlerglieder quer, Schläfen stark eingeschnürt ..... 8.
7. Die Vordere Binde ist viel breiter als der Raum vor ihr, Decken lackglänzend mit kräftigen Punktlinien, Halsschild äusserst fein punktiert. (Philippinen.) ..... **B. philippinensis sp. nov.**
   Die vordere Binde ist viel schmäler, stark gezackt, der schwarze Raum vor ihr breiter als sie. Halsschild sehr deutlich punktiert, die Punkte der Linien kaum grösser als die der Zwischenräume. (Japan.) **B. erotyloides Lewis.**

8. Die vordere Binde ist stark gezackt, besonders am Vorderrand..... 9.
Die vordere Binde ist sehr breit, mit geradem Hinterrand, vorn nach innen nur einfach erweitert. (Sumatra.)..... **B. sumatrensis** sp. nov.
9. Die vordere Binde sendet in der Mitte einen langen Ausläufer nach vorn, dort ist oft ein Basalfleck vorhanden, die Punktreihen der Decken sind in der Mitte sehr deutlich. (Sumatra und Malacca.) **B. longior** sp. nov.
Die vordere Binde ist vorn nur leicht ausgezogen. Decken nur mit Spuren von Punktreihen. (Java.)..... **B. javanus** Chevrolat.

Basanus javanus Chevrolat. Tafel 1, Fig. 1, 2.

Basanus javanus CHEVROLAT, Compt. Rend. Soc. Ent. Belg. 21 (1878) 151.

Mit dieser Art fällt *B. forticornis* Dejean, in litt., zusammen, eine Art die nie beschrieben wurde, sondern nur in den Sammlungen eine gewisse Tradition für sich hatte.

Sehr lang oval, tief schwarz, glänzend, Zeichnung der Decken gelbrot, die beiden ersten Fühlerglieder, Mundteile, und Tarsen meist braun oder gelbbraun.

Der Kopf samt den Augen ist ganz flach, nur auf den Wangen zeigt sich eine sehr flache Mulde, Augenfalten und Augenfurchen fehlen, die Augen quellen stark kugelig vor, sie werden vorn vor den Wangen nur schwach eingeengt, ihr oberer Teil ist kreisrund. Die Wangen sind viel schmäler als die Augen, sie verengen sich bogig nach vorn, ohne ein Epistom abzusetzen. Die Clypeusecken sind verrundet, der mittlere Teil ist vollkommen flach und geht in die Gelenkhaut über. Die Punktierung ist sehr dicht und kräftig, gleichmässig. Die Fühler sind dick, Glied 3 ist kaum so lang wie 4, schwach konisch, 4 und alle folgenden sind quer rechteckig, kurz beborstet, mit grossen Sinnesporen versehen. Das letzte Glied ist oval. Das Kinn ist stark quer trapezisch, ganz flach, ohne Geschlechtsauszeichnung.

Der Halsschild ist etwa 1.5 mal so breit wie in der Mittellinie lang, sehr flach gewölbt, wesentlich schmäler als die Decken, in der Endhälfte parallel, dann nach vorn nicht sehr stark verengt. Die Vorderwinkel ragen deutlich verrundet vor, die Seitenrandkehle ist tief, gleichbreit, und stösst winklig an die Flügeldecken. An der Basis finden sich zwei etwas dreieckige, kräftige Grübchen. Die Punktierung ist wie die des Kopfes sehr deutlich, gleichmässig, der Vorderrand ist undeutlich gerandet. Das Schildchen ist spiegelblank, dunkelbraun.

Die Flügeldecken haben eine gezackte, gelbliche Querbinde im ersten Drittel, welche die Naht breit freilässt und bis zur Sei-

tenrandkehle geht, ihr Hinterrand ist dreizackig, der vordere hat zwei Spitzen, von denen die innere in der Mitte der Decken mehr oder weniger weit nach vorn geht. Der Seitenrand der Decken ist von oben der ganzen Länge nach sichtbar. Der Spitzenfleck ist mässig gross, lässt die Naht breit frei, und stösst hinten an den Ausschnitt der Decken. Die Skulptur ist variabel; es sind normalerweise sehr feine Reihen runder, mässig tiefer Punkte vorhanden, die vollkommen flachen Zwischenräume sind ebenso grob punktiert. Sehr oft verschwimmen die Punkte der Streifen und Zwischenräume ineinander, so dass Reihen nicht mehr erkennbar sind.

Die Unterseite ist bei Ansicht von der Seite sehr fein abstehend behaart. Das Prosternum ist vollkommen wagerecht, am Ende breit verrundet, dünn, unten tief ausgehöhlt, die Mittelbrust leicht eingedrückt und vorn im Eindruck mit einer sehr grossen Schwiele auf welche die Aushöhlung des Prosternums passt. Das Abdomen ist fein punktiert, das Analsegment jederseits mit kräftigem Grübchen. Die Beine sind schlank, die Schenkel dünn, die Schienen fast linear. An den Hintertarsen ist Glied 1 so lang wie der Rest.

Länge, 9 bis 10 Millimeter; Breite, 4 bis 4.4.

Java, Malang; Preanger (*Sijthoff*); Mont Gede, 4,000 Fuss, August, 1892 (*Fruhstorfer*); Pengalengan, 4,000 Fuss (*Fruhstorfer*); Palabuan (*Fruhstorfer*); Preanger, Pelobo cas (*Corporaal*). Südost Borneo (*Grabowsky*).

Siebzehn Exemplare in den Sammlungen Berlin, Dahlem, Leyden, München, und Gebien.

Basanus longior sp. nov. Tafel 1, Fig. 3.

Mit der vorigen Art nahe verwandt, scheint aber nur auf Sumatra and Malacca vorzukommen. Sie ist nicht unwesentlich grösser und schmäler als *javanus*, ähnlich gefärbt, aber die vordere Binde ist viel schmäler, mehr gezackt, und sendet vorn einen langen Ausläufer aus, oft findet sich ein basaler Längsfleck, innen von der Schulter. Der Halsschild ist schmäler, die Punktreihen der Decken sind sehr deutlich, die Punkte der Streifen stehen viel dichter als die der Zwischenräume. Die gelben Flecken und Binden sind meist deutlich erhaben.

Länge, 10 bis 11.3 Millimeter; Breite, 4.1 bis 4.6.

Sieben Exemplare in den Sammlungen Berlin, Dahlem, Leyden, München, Stettin, und Gebien.

Sumatra, Deli, Ober Langkat (*W. Reineck*); Soekaranda, Januar, 1894 (*Dohrn*); Tandjong Morawa, Serdang (*Hagen*);

Pajakombo (*H. Ronyer*). Malacca, ohne genauere Angaben, im Museum München.

Basanus philippinensis sp. nov.

Vorliegende Art steht ebenfalls dem *B. javanus* sehr nahe, so dass eine ausführliche Beschreibung überflüssig ist.

Die Oberseite ist noch glänzender, die ganze Unterseite ist gelbrot bis auf die etwas dunkleren Pleuren, die vordere Binde ist viel breiter als der Raum vor ihr an der Basis, und die Punkte der Reihen sind scharf von den sparsamen Punkten der Zwischenräume getrennt, die Fühlerglieder sind wie bei *javanus* quer.

Länge, 7.8 bis 8.8 Millimeter.

Zwei Exemplare im Museum Stettin von den Philippinen (*Semper*), von denen mir eines für meine Sammlung überlassen wurde. Ferner aus dem Museum Dresden von Luzon, Mount Maquiling, und Malinao, Tayabas (*Baker*).

Basanus erotyloides Lewis.

Basanus erotyloides Lewis, Ent. Mo. Mag. II 2 (1891) 71; Ann. & Mag. Nat. Hist. VI 12 (1894) 396, t. 13, f. 7.

Diese Art aus Japan liegt mir nur in zwei Stücken vor (Sammlungen Berlin und Gebien). Sie gleicht dem *javanus* in Gestalt und Färbung vollkommen und unterscheidet sich nur durch den rauheren Kopf, die nicht queren Fühlerglieder (diese sind quadratisch), die feiner punktierten Zwischenräume, deren Punkte feiner sind als die der Reihen, und durch das rote Abdomen. Die Augen quellen lange nicht so stark vor; demgemäss sind die Schläfen nur schwach eingeschnürt.

Japan.

Basanus erotyloides Lewis **var. annamitus** var. nov.

Bei dieser Aberration des Festlandes ist die ganze Unterseite rot.

Zwei Exemplare von Annam, Phuc Son (*Fruhstorfer*) im Museum Dresden, das mir ein Stück für meine Sammlung überliess.

Basanus sumatranus sp. nov. Tafel 1, Fig. 4.

Ebenfalls mit *javanus* nahe verwandt und in allen Skulpturmerkmalen mit ihm übereinstimmend. Oben und unten schwarz, Zeichnung der Decken gelbrot, Mundteile und Füsse braun. Der Kopf ist flach, nur die Wangen sind leicht eingedrückt, sie sind ganz verrundet, das Epistom ist sehr seicht ausgeschnitten,

die Stirn ist ungefähr 1.5 mal so breit wie eines der stark vorquellenden Augen. Die Punktierung ist sehr fein und dicht, hinten etwas sperriger, nicht rauh. Die Fühler sind wie gewöhnlich dick und stark, Glied 3 ist konisch, länger als 4; alle folgenden sind quer, flach, 1.5 mal so breit wie lang, 4 ist etwas schief, das heist, oben länger als unten, 11 ist flach, lang oval. Das Kinn ist stark quer trapezisch, flach, mit geraden Seiten, hart neben diesen läuft eine feine, scharfe Längsfurche.

Der Halsschild ist an der Basis fast 1.5 mal so breit wie lang, in der Endhälfte fast parallel, die Seitenrandkehle ist gleich breit und kräftig. Der basale Mittellappen ist kräftig abgesetzt. Die Punktierung ist sehr fein und dicht, aber nicht gedrängt, die basalen Grübchen sind rundlich, flach.

Die Flügeldecken sind von der Form wie bei *javanus*, aber anders gezeichnet. Die vordere Binde ist sehr breit, fast etwas breiter als der schwarze Raum vor ihr, ihr Hinterrand ist gerade, der Vorderrand ist nicht gezackt, sondern nur innen erweitert. Der Nahtstreif und die Seitenrandkehle sind schwarz. Der Spitzenfleck ist wie bei *javanus* gebildet. Der ganze Basalteil der Decken ist sehr breit regellos punktiert, erst von kurz vor der Mitte an prägen sich feine Punktlinien aus, deren Punkte gröber sind als die der Zwischenräume, an der Spitze ist der Nahtstreifen furchig vertieft.

Die Unterseite ist ganz schwarz, das Prosternum ist hinten flach, der Fortsatz ganz wagerecht, hinten fast halbkreisförmig abgerundet, die Furche, welche vor den Hüften den Mittelteil des Prosternums von den Pleuren scheidet, ist stark S-förmig geschwungen, tief eingedrückt. Die Beine zeigen keine Artmerkmale.

Länge, 8 Millimeter; Breite, 3.75.

Ein Weibchen von Sumatra, Solok; in meiner Sammlung.

Die ganz andere Zeichnung der Decken scheidet diese Art leicht von *javanus* und den Verwandten.

Basanus apicalis sp. nov. Tafel 1, Fig. 5.

Von der Gestalt des *B. javanus*, aber etwas breiter, glänzend schwarz, Flügeldecken mit gelbroten Binden und Flecken, die viel breiter sind als bei irgend einer andern Art.

Der Kopf ist flach, die Augen quellen seitlich stark vor, die Schläfen schnüren daher den Hinterkopf stark ein und liegen dem Hinterrand der Augen dünn an. Die Stirn ist 1.5 mal so breit wie ein Auge, die Punktierung ist ausserordentlich fein

und sehr eng. Die Wangen sind kaum aufgebogen, sondern ebenfalls fast flach; die Vorderecken des Epistoms sind breit verrundet. Die Fühler sind sehr dick, die Glieder vom vierten an stark quer, die mittleren und vorletzten 1.5 mal so breit wie lang, das letzte ist so breit wie lang, am Ende ganz rund. Das Kinn ist genau trapezisch, flach, der Vorderrand etwas breiter als die Mittellinie lang, jederseits findet sich eine gerade, feine, schräge Furche.

Der Halsschild ist ähnlich wie bei *javanus*, aber breiter, an der Basis fast doppelt so breit wie die Mittellinie lang, die Vorderecken treten wenig vor. Die Basalgrübchen sind stark, der Ausschnitt an der Basis jederseits des Mittelstücks ist gut entwickelt, die Punktierung ist fein aber sehr deutlich, ziemlich eng, nirgend gedrängt.

Die Punktreihen der Flügeldecken sind nur in der Mitte deutlich, aber sehr fein, ihre Punkte ebenso grob wie die der Zwischenräume, die ziemlich eng punktiert sind, vorn und hinten erlöschen die Streifen und die Punktierung ist feiner. Die vordere Binde ist so breit wie der schwarze Raum vor ihr, sie ist vorn und hinten in der inneren Hälfte 3-zackig und lässt die Naht breit frei. Der hintere Fleck ist auffallend gross, so lang wie der schwarze Raum vor ihm, er lässt nur den Nahtstreif und den aufgebogenen Rand schwarz.

Die Unterseite ist ganz schwarz, die Furche des Prosternums vorn jederseits der Mitte ist im vorderen Teil nicht scharf ausgeprägt, sondern mehr ein Eindruck, der Fortsatz ist jederseits gekantet, der Abfall seitlich senkrecht.

Länge, 10 Millimeter; Breite, 4.3.

Zwei Exemplare aus der Sammlung Veth, davon jetzt eines in meiner eigenen, von Java, ohne genauere Angabe.

Von allen Arten durch die breite, innen dreizackige Vorderbinde und den auffällig grossen Spitzenfleck leicht zu unterscheiden.

Basanus pictus sp. nov. Tafel 1, Fig. 6.

Sehr gross, lang gestreckt, querüber stark gewölbt, mit bunter, rotgelber oder roter Zeichnung auf den Decken, roten Flecken auf dem Pronotum, in der Mitte rötlichen Kopf, roter Schenkelmitte und ebenso gefärbten Rändern des Abdomens.

Kopf flach eingedrückt, die Seiten des Vorderkopfes sind ziemlich stark aufgebogen, wodurch der mittlere Teil flach muldig vertieft erscheint. Die Punktierung ist sehr dicht, kräftig, fast

rauh, nur hinten findet sich eine glänzende Schwiele, auch die Wangen und ein Rand vor den Augen sind glänzend. Das Epistom ist flach ausgeschnitten, fast gerade. Die Fühler sind dick und sehr lang. Glied 3 ist schwach konisch, viel länger als breit, 4 breiter als lang, schief, das heist, oben viel länger als unten, die folgenden Glieder sind stärker quer, die vorletzten fast doppelt so breit wie lang, das letzte ist quadratisch mit verrundeten Ecken. Die Augen werden durch die Wangen fast bis zur Mitte eingeschnürt, das Kinn ist so breit wie lang, trapezisch, flach, ohne Gruben und Furchen, die Ligula sehr flach und breit.

Das Pronotum ist kaum $1\frac{1}{3}$ mal so breit wie lang, in der Endhälfte parallel, schwarz, mit drei roten Flecken versehen, die Mitte ist ziemlich breit rot, dieser Fleck vorn etwas, an der Basis stärker verbreitert, jederseits findet sich eine grosse, längliche Makel, so entstehen also auf dem Halsschild zwei gebogene, schwarze Längsbinden. Die basalen Grübchen sind rund, kräftig, die Seitenrandkehle ist gleichbreit. Die Punktierung ist sehr dicht, fein, aber deutlich, an den Seiten gedrängt, der basale Mittellappen ist undeutlich abgesetzt.

Die Zeichnung der Flügeldecken ist charakteristisch. An der Basis findet sich ein länglicher Fleck, gleichweit von Naht und Schulter entfernt, vor der Mitte eine schmale, breit W-förmige Binde, welche den Nahtstreif freilässt, ein dritter Fleck liegt an der Spitze, er ist hinten sehr breit, von seiner Mitte vorn geht ein schmaler Ast ab, der sich verbreitert und vorn schwach gablig ist, die Aeste dieser sehr kurzen Gabel liegen im dritten und fünften Zwischenraum. Die Punktierung ist vorn regellos, ungefähr von der Mitte an zeigen sich deutliche Punktlinien, die meist paarweise etwas genähert sind. Die Zwischenräume sind sehr sparsam punktiert, die Spitze ist leicht grubig vertieft.

Das Prosternum hat jederseits neben dem vorderen Mittelteil eine zuerst gerade, scharfe Furche, die nur neben den Hüften geschwungen ist. Im Uebrigen bietet die Unterseite nichts Bemerkenswertes.

Länge, 11.8 bis 13.1 Millimeter; Breite, 4.8 bis 5.2.

Fünf Exemplare in den Sammlungen Dahlem, Sarawak, und Gebien.

Borneo, Kusin Hills, bei Banting, 21 Mai, 1909; Kuching, 13 Dezember 1902 (*Moulton*). Sumatra, Medan.

Die grösste der Arten, an dem gewölbten Körper, der sehr bunten Zeichung, und dem gefleckten Halsschild leicht kenntlich.

Basanus celebensis sp. nov.

Von der Gestalt der flachen *Platydema*-Arten, aber etwas länglicher. Der ganze Körper ist gelbrot, nur die Flügeldecken bis auf die gelbrote Spitze und die letzten acht Fühlerglieder sind schwarz.

Der Kopf ist ganz flach, die Wangen sind nicht aufgebogen, auch am Vorderkopf nicht. Die Punktierung ist ausserordentlich fein, nicht sehr eng, ungleichmässig. Die Augen sind klein und quellen nicht sehr stark vor, ihr Hinterrand ist also nicht senkrecht auf den Hals gesetzt, wie bei *apicalis* zum Beispiel, oder *javanus;* die Stirn ist ungefähr viermal so breit wie ein Auge von oben gesehen. Die Fühler sind wie gewöhnlich stark entwickelt, nur die ersten drei Glieder sind gelb, das Ende des elften Gliedes ist braun, Glied 3 ist kaum 1.5 mal so lang wie dick, schwach konisch. Vom vierten an sind alle Glieder kräftig quer, die vorletzten noch stärker, das letzte ist doppelt so lang wie das vorletzte, lang oval, an der Spitze nicht abgestutzt. Das Kinn ist breiter als lang, genau trapezisch, flach, mit sehr feiner Randfurche, jederseits der Mitte findet sich ein feiner Porenpunkt.

Der Halsschild ist an der Basis fast doppelt so breit wie in der Mittellinie lang, die Seiten sind von den Hinterecken an nach vorn verengt. Der basale Mittellappen ist nicht sehr stark entwickelt, die basalen Grübchen sind sehr flach und ganz undeutlich. Die Punktierung ist ausserordentlich fein und wenig dicht. Die Spitzenrandung ist vollständig, die Seitenrandkehle breit und kräftig aufgebogen. Das Schildchen ist rot.

Die Flügeldecken sind auch in der Mitte nicht parallel, flach, schwarz, glänzend, der ganze Spitzenteil der Decken ist gelbrot, es sind also nicht wie bei andern Arten abgegrenzte Spitzenflecke vorhanden. Die Punktlinien sind meistens ausgeprägt und zwar im mittleren Teil ihres Verlaufs; sie sind ausserordentlich fein, wenig stärker als die Zwischenräume punktiert, bei einigen Exemplaren sind aber Linien nicht mehr erkennbar. Der Nahtstreif ist leicht furchig vertieft.

Die ganze Unterseite ist gelb oder gelbrot, nackt, die Prosternalnähte vorn jederseits der Mitte sind vollständig, sehr stark S-förmig gekrümmt, das Prosternum ist ganz wagerecht, hinten breit, der Seitenabfall des Fortsatzes ist schräge, er ist also nicht gekantet. Der Eindruck des Mesosternums geht bis an den Rand des Metasternums.

Länge, 6.1 bis 7 Millimeter; Breite, 3 bis 3.6.

In den Sammlungen Berlin, Dahlem, Dresden, Leyden, und Gebien, 11 Exemplare, sämtlich aus derselben Quelle.

Süd-Celebes, Lampa-Battan, 3,000 Fuss, März, 1896 (*Fruhstorfer*).

Diese Art ist viel breiter als die andern und von ihnen durch ungefleckte Flügeldecken (nur die Spitze ist breit hell gefärbt), den übrigen gelben Körper, und das nicht gekantete Prosternum weit verschieden.

Basanus hellus sp. nov. Tafel 1, Fig. 7.

Viel gewölbter und ovaler als die typischen Arten der Gattung, von der Gestalt eines gestreckten *Scaphidema metallicum*. Unterseite, Kopf, und Halsschild rotgelb, dieser mit starkem, bläulichen Schein, Beine heller, fast gelb, ein verwaschener Spitzenfleck ebenfalls rot, ein grosser Fleck vorn auf den Decken gelb, diese selbst blaugrün.

Der Kopf ist ganz flach, nur auf dem Epistom findet sich vorn jederseits ein sehr flacher Eindruck. Die Wangen verengen sich sehr schnell und fast geradlinig nach vorn, die Ecken vorn sind breit verrundet, die Punktierung ist nicht eng, fein, aber ungleich stark. Die Stirn ist über doppelt so breit wie eines der stark queren, seitlich kräftig vorquellenden Augen. Die Schläfen sind stark eingezogen, aber die Einschnürung ist am Hals nicht eckig. Die Fühler reichen bis zur Basis des Halsschildes, sie sind ausserordentlich dick, alle sehr gedrungen aufeinander sitzenden Glieder sind stark quer, nur das letzte ist lang oval. Das Kinn ist quer trapezisch, in der Mitte leicht gewölbt, ohne deutliche Furche jederseits.

Der Halsschild ist an der Basis doppelt so breit wie in der Mittellinie lang, die Spitze ist nur sehr seicht ausgebuchtet, die breit verrundeten Vorderecken treten schwach vor, die Randung dort ist scharf und vollständig. Die Seiten sind in der Basalhälfte parallel, dann gerundet nach vorn verengt, die basalen Grübchen sind sehr seicht, die Punktierung ist ausserordentlich fein und nicht dicht.

Die Flügeldecken sind so stark gewölbt dass der Seitenrand nur hinter der Schulter sichtbar ist, sie sind glänzend blaugrün, die Punktlinien sind wie gewöhnlich nur in der Mitte ausgeprägt, nur die erste ist der ganzen Länge nach entwickelt und leicht furchig vertieft, besonders an der Spitze, die äusseren Linien sind erloschen. Die Punktierung der Zwischenräume ist sehr sparsam und nur bei sehr starker Vergrösserung sichtbar.

Der vordere Fleck ist breiter als der Raum vor ihm, er ist fast kreisrund, mit gerader Basis und nur nach der Seite hin etwas ausgezogen, er lässt den Rand breit freit und ebenso die beiden innern Zwischenräume. Die Spitze ist dunkelrot, nicht mit scharf begrenztem Fleck versehen. Die ganze Oberfläche der Decken ist sehr sparsam, unauffällig, kurz gelb beborstet. Die äusserste Randkante hat einen Saum sehr kurzer, abstehender Wimperbörstchen.

Die Unterseite ist kahl, die Prosternalnähte sind vorn nicht eingeschnitten, sondern nur eingedrückt. Der Fortsatz ist flach, jederseit undeutlich gerandet, am Ende breit. Die Beine sind kurz und dick. Die vorderen Schienen sind viel kürzer als bei andern Arten und zur Spitze viel breiter. An den dünnen Hintertarsen ist Glied 1 so lang wie 3 + 4.

Länge, 4.2 Millimeter; Breite, 2.

Ein Exemplar von den Philippinen, Mount Banahao (*Baker*).

Diese kleinste Art der Gattung bildet in ihr einen etwas fremden Bestandteil. Sie weicht nicht nur durch die Zeichnung sondern besonders durch blaugrüne Decken ab, die so stark gewölbt sind dass der Seitenrand zum grössten Teil verdeckt ist, im Gegensatz zu allen andern Arten, deren flache Decken den Seitenrand breit frei lassen. Ein wichtiges Merkmal ist auch die Behaarung der Decken und der zarte Wimpersaum; beide sind aber so fein dass sie nur bei guter Vergrösserung sichtbar sind.

Basanus misellus sp. nov.

Klein, flach, einfarbig gelblich braun, nur die mittleren Fühlerglieder schwarz.

Der Kopf ist quer, flach, äusserst fein punktiert, und vorn querüber leicht eingedrückt; die Wangen haben kein deutliches Grübchen. Die Augen quellen stark vor, bis zu ihrem Hinterrand sitzt der Kopf im Pronotum. Die Fühler sind mässig dick; die ersten drei Glieder (das dritte in der Basalhälfte) und die Spitze des letzten Gliedes sind hell gefärbt, die andern schwarz; vom vierten an sind die Glieder quer, das letzte ist 1.5 mal so lang wie breit.

Der Halsschild ist fast doppelt so breit wie in der Mittellinie lang, die Basalhälfte ist fast parallel, nach vorn nur wenig verengt, die Hinterecken sind etwas schräg abgeschnitten, wodurch die Mitte der Basis stark nach hinten gezogen erscheint. Die Seitenrandung ist sehr breit und tief, die basalen Grübchen sind gut ausgeprägt. Die Querwölbung des Pronotums ist

besonders vorn ziemlich stark; die Spitzenrandung ist sehr fein und vollständig, die Vorderecken ragen nicht vor. Die Punktierung ist ausserordentlich fein, ziemlich eng.

Die Flügeldecken haben äusserst feine, aufstehende, kurze, fast weisse Härchen, die nur bei guter Vergrösserung und starker Beleuchtung sichtbar sind; der Rand ist mit sehr feinen Wimperchen versehen. Die Oberfläche hat sieben Reihen gut ausgeprägter, grosser, runder Punkte, die äusseren fehlen. Der Nahtstreif ist hinten vertieft, die anderen verlieren sich dort. Die Zwischenräume sind fast flach und ausser mit sehr feiner Grundpunktierung mit einer unordentlichen, sehr weitläufigen Reihe ziemlich grober Punkte versehen, die so gross wie die der Reihen sind.

Die Unterseite ist nur auf dem Prosternum schwach undeutlich behaart; dieses ist ganz flach, hinten breit, und fällt zur Seite nicht scharfkantig ab. Das Abdomen ist unpunktiert und hat auf dem letzten Segment kein Grübchen. Beine dünn, an den Hintertarsen ist Glied 1 gleich 3 + 4.

Länge, 4.5 Millimeter.

Ein Exemplar von den Philippinen, Mindanao, Kolambugan; ferner im Museum Dresden vom Mount Banahao (*Baker*).

Diese kleine Art ist an dem einfarbigen, hellen Körper und den kräftigen Punktreihen der Decken sofort zu erkennen. Am nächsten steht *B. hellus*, ist aber stark gewölbt, hat sehr dicke Fühler und recht bunte Oberseite.

Genus **DIAPERIS** Linnæus [7]

Diese Gattung enthält nur wenig Arten, hat aber eine ausserordentlich weite Verbreitung. Sie findet sich durch ganz Europa, das gemässigte Asien, China, Japan, beide Indien, Ceylon, und Nordamerika bis Mexiko. Uebrigens ist auch eine Art aus Cayenne beschrieben (*D. coccinea*). Ob diese aber wirklich zur Gattung gehört möchte ich bezweifeln; die Beschreibung bietet keinerlei Anhaltspunkte. Die andern Arten sind mir alle bekannt. Sie sind alle nahe miteinander verwandt und einander sehr ähnlich. Plastische Merkmale sind nicht häufig, finden sich am Prosternum und bei der Kopfbildung. Geschlechtsmerkmale finden sich nur bei *D. maculata* Olivier aus Nordamerika, bei Welcher das Männchen am Epistom zwei spitze Tuberkeln zeigt.

[7] Ueber die Litteratur siehe Gebien, Col. Cat., pars 28, p. 364.

Bestimmungstabelle für die asiatischen Diaperis-Arten.

1. Die Stirn ist doppelt so breit wie ein Auge, tief und ganz ausgehöhlt, das Epistom mit Tuberkelähnlicher Erhabenheit, der Spitzenfleck ist klein, dreieckig, Prosternum vorn in der Mitte mit Ecke. Grosse Art. (Japan.) ..... **D. niponensis** Lewis.
   Die stirn ist nicht breiter als ein Auge, nicht ausgehöhlt, Epistom einfach gewölbt, Spitzenfleck der Decken nach vorn ausgedehnt und dort verzweigt. Prosternum vorn heruntergebogen. Arten von der Grösse unserer *D. boleti* ..... 2.
2. Die vordere schwarze Binde der Decken ist vollständig, Punktierung der Decken so fein oder feiner als bei *boleti*. (Nordchina, Sibirien, und Japan.) ..... **D. lewisi** Bates.
   Die vordere Binde ist mehrfach unterbrochen ..... 3.
3. Nahtstreif vorn vor der schwarzen Binde schwarz. Punktierung der Decken so fein wie bei *boleti*. (Formosa und Indo-China.) **D. l. var. intersecta** Gebien.
   Nahtstreif vorn rot oder gelbrot. Punktierung der Decken gröber als bei *boleti* ..... 4.
4. Grundfarbe der Decken korallenrot, hintere schwarze Querbinde sehr schmal meist von der roten Farbe unterbrochen. (Ceylon.) **D. sanguineipennis** Bates.
   Grundfarbe der Decken gelb, hintere Binde sehr breit und ununterbrochen. (Südchina.) ..... **D. s. var. sinensis var. nov.**

Zu einer Neubeschreibung der Arten liegt umsoweniger Veranlassung vor, als die Beschreibungen bei Lewis und Bates auf alle wesentlichen Merkmale eingehen. Bei der neuen Varietät *sinensis* bin ich wirklich im Zweifel, ob ich sie neben *intersecta* zu *lewisi* stellen soll, oder als eine geographisch weit getrennte Rasse, der grösseren *sanguineipennis*. Ich lasse sie vorläufig bei der letzteren Art.

Diaperis niponensis Lewis.

Diaperis niponensis Lewis, Entomologist 20 (1887) 217.

Japan, Nikko, Mayebara, Junsai, Sapporo.

Diese Art scheint in den Sammlungen sehr selten zu sein. Mir liegt nur ein einziges, vom Autor gesammeltes Stück in meiner Sammlung vor, das ich aus dem Britischen Museum erhielt.

Diaperis lewisi Bates.

Diaperis lewisi Bates, Ent. Mo. Mag. 10 (1873–1874) 14.
Diaperis rubrofasciatus Reitter, Deutsche Ent. Zeitschr. 23 (1879) 226.

Japan, Nagasaki, Kumamoto, Miyanoshita, Tokio. Sibirien. Korea (var. *intersecta* Gebien, Archiv Natg. 79, 1913 (1914)

Abt. A, Heft 9, 15, 1 Tafel). Formosa, in grosser Zahl von verschiedenen Fundorten. Annam, Phuc Son (*Fruhstorfer*); Tonkin, Montes Mauson (*Fruhstorfer*); Laos; Tenasserim, Mount Mooleyit, 1,000 bis 1,900 Meter, April, 1887 (*L. Fea*); Burma, Carin Cheba, 1,000 bis 1,100 Meter, April bis Dezember, 1888 (*Fea*).

Diaperis sanguineipennis Bates.

Diaperis sanguineipennis BATES, Ent. Mo. Mag. 10 (1873–1874) 17.
Diaperis ceylonica CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 170.

Ceylon (*Nietner*).

Acht Exemplare in den Sammlungen Berlin, Stettin, und Gebien.

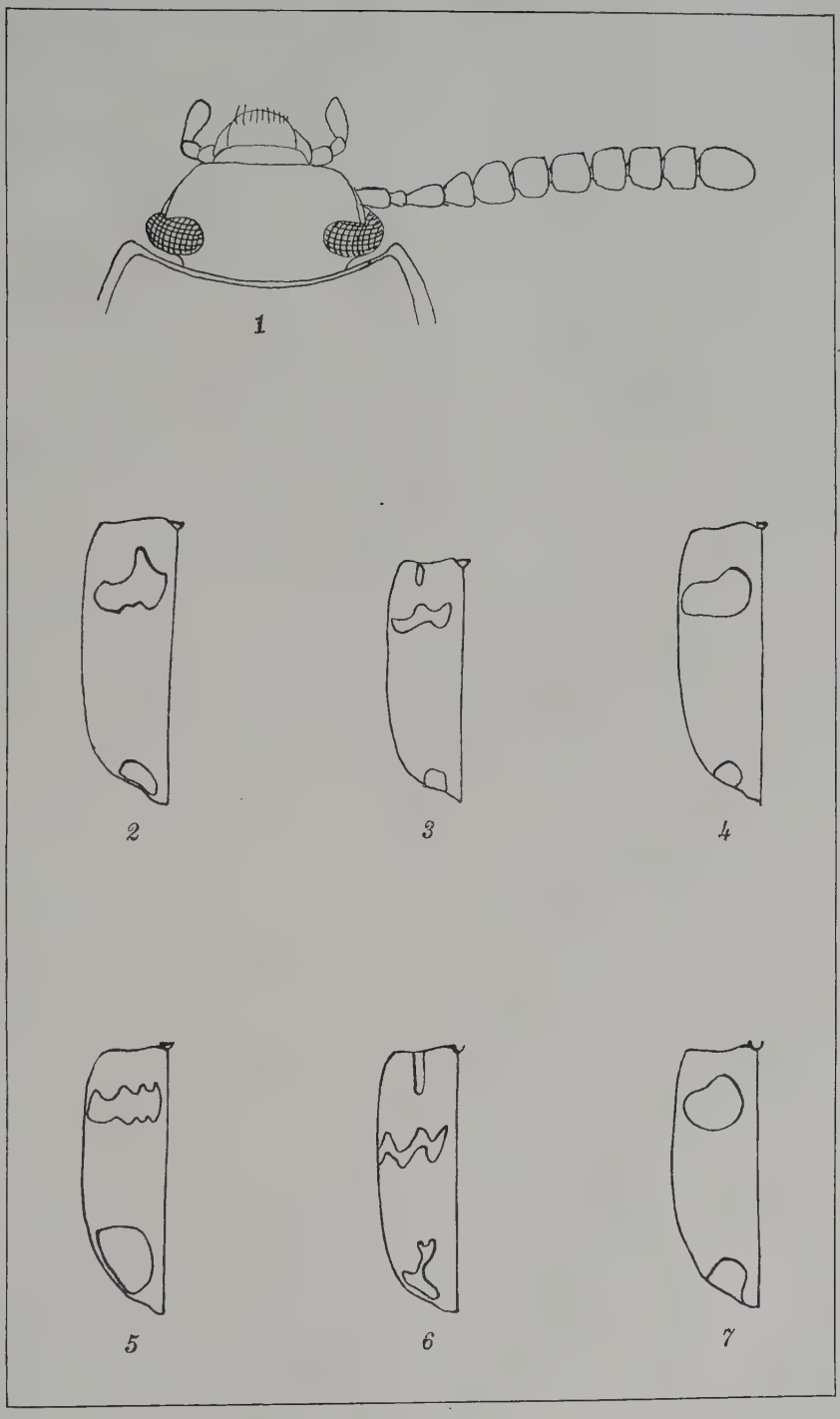
Diaperis sanguineipennis Bates var. sinensis var. nov.

China, Hongkong; Canton: Lien-cas, 23ter Juli, 1912 (*Mell*). In Anzahl in den Sammlungen Gebien und Berlin.

ILLUSTRATION

Tafel 1

Fig. 1. *Basanus javanus* Chevrolat. Kopf.
2. *Basanus javanus* Chevrolat. Deckenzeichnung.
3. *Basanus longior* sp. nov. Deckenzeichnung.
4. *Basanus sumatranus* sp. nov. Deckenzeichnung.
5. *Basanus apicalis* sp. nov. Deckenzeichnung.
6. *Basanus pictus* sp. nov. Deckenzeichnung.
7. *Basanus hellus* sp. nov. Deckenzeichnung.



TAFEL 1.

NOMENCLATORIAL NOTES ON THE JASSOIDEA, III

By C. F. Baker

Dean, College of Agriculture, Los Baños

In this journal [1] I published a second paper on the endemic Philippine genus *Makilingia,* rearranging the species and describing a number of new ones. The paper had been submitted for publication many months prior to its appearance. In the interval some of the material collected by Boettcher in the Philippines drifted into the hands of Dr. L. Melichar, who described and promptly published four supposedly new species of *Makilingia.*[2] This prior paper did not come to my notice until some months after the appearance of my own paper, when my attention was kindly called to it by Dr. E. Bergroth. The new forms described by Melichar are all common ones from regions long since collected over by us at various times, so that they are all represented in my later paper. Two of them are merely color forms of the protean species described by me under the name *variabilis,* falling within that species as described, although names were not applied to the various color variations represented. The complete synonymy arising from the publication of these two papers is as follows:

Makilingia variabilis Baker is *M. intermedia* Melichar.

Makilingia bakeri Melichar is *M. intermedia* Melichar var. *bakeri* Melichar.

Makilingia suturalis Melichar is *M. intermedia* Melichar var. *suturalis* Melichar.

Makilingia bimaculata Baker is *M. flavifrons* Melichar.

Further changes in jassid names made necessary by conflicts are as follows:

Phlepsius lathropi n. n. for *P. annulatus* Osborn and Lathrop, 1923, not *P. annulatus* Osborn, 1923.

[1] Philip. Journ. Sci. 24 (1924) 57–70.

[2] Wien. Ent. Zeit. 40 (1923) 17–120.

Phlepsius melichari n. n. for *P. pallidus* Melichar, 1911, not *P. pallidus* Van. D., 1892.

Athysanus[8] **lindbergi** n. n. for *Athysanus fraterculus* Reut., 1887, not *A. fraterculus* Berg, 1879.

Dikraneura marginella n. n. for *D. marginata* De Long, 1924, not *D. marginata* Sahlb., 1871.

Empoasca hartzelli n. n. for *E. vittata* Hartzell, 1923, not *E.* (*Chlorita*) *vittata* Lethierry.

[8] Possibly the old genus *Athysanus* should be broken up into several more homogeneous groups: *Athysanus* Burm., 1838, type *argentatus* Fabr.; *Euscelis* Br., 1832, type *lineolatus* Br.; and perhaps *Ophiola* Edw. European homopterists should decide on the practicability of this and make known the proper reference of all the palæarctic species. Some of them may be referable to closely allied generic groups proposed by Distant and Matsumura. The same might be said of *Deltocephalus*, which has become extremely heterogeneous, and has had many proposed generic groups split off from it in other parts of the world, which must now be fully considered in relation to the palæarctic species.

THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 27 JUNE, 1925 No. 2

FIVE NEW SPECIES OF CHINESE PLANTS

By ELMER D. MERRILL

Of the College of Agriculture, University of California, Berkeley

The following diagnoses and descriptions of five species of Chinese plants, apparently hitherto undescribed, are based on material collected by Prof. K. K. Ts'oong, of Peking University; Mr. H. H. Chung, of Amoy University; and Mr. A. N. Steward, of Nanking University. The types are preserved in the herbarium of the University of California.

URTICACEÆ

Genus **ELATOSTEMA** Forster

Elatostema stewardii sp. nov.

Herba erecta, simplex, 25 ad 30 cm alta, subglabra; foliis valde inaequalibus, inferioribus obovatis, rotundatis, 1.2 ad 3 cm longis, superioribus gradatim longioribus, inaequilateralibus, plus minusve falcatis, tenuiter subcaudato-acuminatis, grosse serrato-dentatis, oblongis ad oblongo-ellipticis, usque ad 6 cm longis, membranaceis, supra cystolithis numerosis instructis, utrinque, praesertim junioribus, parce et breviter ciliato-setosis; receptaculis ♀ sessilibus, circiter 3 mm diametro, bracteis bracteolisque obscure ciliatis, bracteis exterioribus plus minusve connatis, 1 ad 1.2 mm longis, planis vel obscure cucullatis, haud corniculatis, bracteolis membranaceis, brevioribus, ellipticis, rotundatis; acheniis 0.8 mm longis.

An erect, simple, rather slender herbaceous plant, 25 to 30 cm high, the stems glabrous, about 2 mm in diameter below, slenderer above, and sparingly ciliate near the apex. Leaves membranaceous, green when dry, of the same color on both surfaces, especially when young, sparingly ciliate-setose with short, scattered, white hairs, the upper surface with numerous small cystoliths, the margins coarsely serrate-dentate, or those of the lower leaves crenate, 8 to 13 teeth on the broader side, somewhat fewer on the narrower side, the lower leaves obovate, broadly rounded, 1 to 3 cm long, the upper gradually longer, the uppermost oblong to oblong-elliptic, slenderly subcaudate-acuminate, the acumen about 1 cm long, distinctly inequilateral, more or less falcate, the base rounded on one side, acute on the other, the broader side with three sharply ascending nerves, the inner one extended and arched-anastomosing with few (usually 4), lateral nerves, the well-developed marginal teeth up to 5 mm long along the longer side. Petioles none. Stipules lanceolate, 3 to 5 mm long. Pistillate flowers axillary, sessile, the inflorescences many-flowered, subglobose, 3 mm in diameter, the bracts and bracteoles thin, slightly ciliate, the outer bracts more or less united, 1 to 1.2 mm long, plane or somewhat cucullate, not spurred, the bracteoles elliptic, rounded, shorter than the bracts. Achenes 0.8 mm long. Staminate flowers unknown.

Kiangsi Province, Lu Shan, near Kuling, *A. N. Steward 2628*, July 31, 1922, on shaded damp banks near springs at the Emerald Pool, altitude about 700 meters.

A species belonging in the general group with *Elatostema sessile* Forst. but remote from the typical form of Forster's species. It is well characterized by its variable leaves, the lower ones being broadly obovate, crenate, rounded, gradually becoming longer upward and changing in shape, the upper ones being elongated, falcate, caudate-acuminate, serrate-dentate, conspicuously inequilateral, and in general oblong to elliptic-oblong.

LEGUMINOSÆ

Genus **CAESALPINIA** Linnæus

Caesalpinia tsoongii sp. nov.

Frutex scandens, aculeatus, subglaber (floribus ignotis), ramulis teretibus, plus minusve ferrugineo-pubescentibus; foliis saltem 30 cm longis, bipinnatis, foliolis paucis, oblongo-ovatis,

coriaceis, acuminatis, basi rotundatis, plerumque leviter inaequilateralibus, usque ad 9 cm longis, supra glabris, subtus pallidioribus, glabris, vel junioribus obscurissime pubescentibus; fructibus inermis, compressis, inaequilateraliter orbiculari-ovatis, circiter 4 cm longis, apice inaequilateraliter abrupteque apiculato-rostratis, in siccitate castaneis, nitidis, distincte reticulatis. Seminibus solitariis, 2 cm diametro.

A scandent shrub, armed with short, scattered, stout, recurved spines on the branchlets and on the primary and secondary axes of the bipinnate leaves, the spines 1.5 to 3 mm long, the younger parts more or less ferruginous-pubescent, in age becoming glabrous or nearly so, the ultimate branchlets 3 to 4 mm in diameter, terete. Leaves bipinnate, at least 30 cm long, the pinnæ 2 or 3 pairs, their axes 8 to 9 cm long. Leaflets about 3 pairs, oblong-ovate, coriaceous, acuminate, base rounded, usually more or less inequilateral, 6 to 9 cm long, 2.5 to 3.5 cm wide, the upper surface glabrous, pale olivaceous, somewhat shining, the lower surface somewhat paler, sparingly pubescent along the midrib, becoming glabrous; lateral primary nerves about 20 on each side of the midrib, slender, rather distinct, anastomosing, the reticulations evident on both surfaces; petiolules about 1 mm long. Infructescence apparently terminal, paniculate, sparingly pubescent, the rachis terete, about as thick as the branchlets. Fruits smooth, unarmed, compressed, inequilaterally orbicular-ovate, about 4 cm long, 3.5 cm wide, the upper suture slightly curved, with a thickened, narrow (1.5 mm) wing or keel, the lower suture semicircular, not keeled or thickened, the inequilateral apex with a prominent beak about 5 mm long, the valves coriaceous, castaneous, shining, distinctly reticulate. Seed solitary, castaneous, compressed, nearly circular in outline, 2 cm in diameter.

Szechuen Province, without definite locality, *K. K. Ts'oong 4190*.

A remarkably distinct species, characterized by its relatively large leaflets and its glabrous, compressed, unarmed, reticulate, orbicular-ovate, 1-seeded fruits. Although probably most closely allied to *Caesalpinia nuga* Ait., it is remote from that species, differing totally in its vegetative and fruit characters. It is not at all related to *Caesalpinia szechuensis* Craib, the only other species of the genus definitely recorded from Szechuen Province other than the well-known and widely distributed *C. sepiaria* Roxb.

SABIACEÆ

Genus MELIOSMA Blume

Meliosma stewardii sp. nov. § *Simplices.*

Arbor parva, circiter 5 m alta, ramis glabris, ramulis parce adpresse ferrugineo-setosis vel ciliatis; foliis chartaceis vel submembranaceis, oblongo-ellipticis, 10 ad 14 cm longis, plerumque utrinque subaequaliter angustatis, basi acutis, apice tenuiter acute acuminatis, dentatis, dentibus incurvato-mucronatis, distinctis, margine deorsum integris, supra glabris, brunneo-olivaceis, subtus pallidioribus, ad costa nervisque distincte albido-ciliatis vel pilosis, axillis subbarbatis, nervis utrinque circiter 20, perspicuis; petiolo 1 ad 1.5 cm longo; paniculis terminalibus, pyramidatis, circiter 10 cm longis, ferrugineo-pubescentibus, ramis patulis, inferioribus ad 6 cm longis; floribus breviter pedicellatis, sepalis elliptico-ovatis, obtusis, obscure pubescentibus vel subglabris, 0.6 mm longis; ovario glabro, stylo 0.7 mm longo.

A small tree, about 5 m high, the branches glabrous, dark gray, terete, about 2 mm in diameter, the branchlets sparingly ferruginous setose or ciliate, the indumentum appressed. Leaves chartaceous or submembranaceous, scattered, simple, oblong-elliptic, 10 to 14 cm long, 3.5 to 5 cm wide, subequally narrowed to the acute base and to the conspicuously acute-acuminate apex, the upper surface brownish olivaceous, smooth, glabrous, the lower surface somewhat paler, the midrib and nerves distinctly white-ciliate or pilose, the indumentum somewhat denser in the axils, the surface glabrous, the margins with conspicuous teeth terminating each nerve, their tips incurved-mucronate; lateral nerves about 20 on each side of the midrib, prominent, straight, the primary reticulations lax, subparallel, distinct; petioles 1 to 1.5 cm long. Panicles terminal, erect, pyramidal, shortly peduncled, about 10 cm long, the primary branches few, spreading, the lower ones up to 6 cm long, the indumentum of short, somewhat spreading hairs. Flowers rather scattered, shortly pedicelled, the bracts lanceolate, acuminate, pubescent, about 1 mm long, the bracteoles similar but smaller. Sepals elliptic-ovate to broadly ovate, rounded, slightly pubescent or nearly glabrous, 0.6 mm long. Ovary ovoid, glabrous; style 0.7 mm long.

Kiangsi Province, Kuling, *A. N. Steward 2443*, July 7, 1922. In thickets on slopes, altitude about 1,300 meters.

A species belonging in the general group with *Meliosma dilleniaefolia* Hook. f.; among the Chinese species manifestly allied to *Meliosma cuneifolia* Franch. and *M. myrianthum* S. and Z., from both of which it differs in its vegetative characters and in its shorter panicles.

LYTHRACEÆ

Genus LAGERSTROEMIA Linnæus

Lagerstroemia limii sp. nov. § *Velaga.*

Species *L. subcostatae* Koehne affinis, differt calycis tubo extus hirsuto, inter lobis perspicue appendiculatis, appendicibus reniformibus, circiter 3 mm latis.

A shrub or small tree, the branches terete, brownish, glabrous, the bark more or less stringy, the branchlets terete, usually densely pubescent. Leaves elliptic to oblong-elliptic, coriaceous to subcoriaceous, 6 to 9 cm long, 2.5 to 4 cm wide, base acute to somewhat rounded, apex shortly and rather sharply acuminate, olivaceous, very obscurely pubescent, becoming glabrous, the lower surface rather densely pubescent on the midrib, nerves and reticulations with short soft hairs; lateral nerves about 10 on each side of the midrib, prominent; petioles pubescent, about 2 mm long. Panicles up to 15 cm long, the rachis densely pubescent, the primary branches few, pubescent. Flowers pink to purplish. Calyx tube cup-shaped, about 5 mm in diameter, distinctly 12-ribbed, hirsute outside, especially on the ribs, the lobes usually 6, oblong-lanceolate, somewhat acuminate, 3 to 3.5 mm long, with alternating thickened, reniform appendages about 3 mm wide attached to the outside of the tube. Filaments of the episepalous stamens about 10 mm long, the smaller stamens about 35, their filaments 7 mm long. Ovary ellipsoid, glabrous; style 13 mm long. Petals slenderly clawed, the claw about 6 mm long, the limb crisped, orbicular-ovate, rounded, base truncate-rounded to deeply cordate, 7 to 8 mm in diameter.

Fukien Province, Amoy, *H. H. Chung 1644* (type), *1682*, May and June, 1923. Somewhat less pubescent forms are represented by *Chung 801* and *1770*.

This species is manifestly related to *Lagerstroemia subcostata* Koehne, but differs remarkably through the appendaged calyx tube, the conspicuous, reniform, spreading or reflexed, thickened appendages alternating with the calyx lobes. The calyx tube is also conspicuously hirsute, not glabrous. It is dedicated to Dr. Lim Boom Keng, president of Amoy University, in appreciation

of his interest in the prosecution of botanical work in Fukien Province.

MYRSINACEÆ

Genus EMBELIA Burman

Embelia hainanensis sp. nov. § *Pattara.*

Frutex ut videtur scandens, racemis glanduloso-pubescentibus exceptis glaber, ramis ramulisque teretibus, lenticellatis, tenuibus; foliis chartaceis, oblongis ad oblongo-ellipticis, integris, 5 ad 8 cm longis, petiolatis, utrinque subaequaliter angustatis, basi acutis, apice obtusis, admodum obscure retusis, nervis primariis utrinque 5 ad 7, distantibus, distinctis, arcuato-anastomosantibus; inflorescentiis stricte racemosis, 3 ad 5 cm longis, axillaribus, solitariis, multifloris; floribus 5-meris, calycis glandulosis, leviter pubescentibus, lobis acutis, 0.5 mm longis; petalis glandulosis, symmetricis, oblongo-ellipticis, obtusis, 1.8 mm longis, filamentis quam petalis paullo longioribus, obscure pubescentibus, antheris late ovatis, obtusis vel rotundatis.

A shrub, apparently scandent, entirely glabrous except the glandular-pubescent racemes. Branches and branchlets slender, terete, lenticellate, brownish. Leaves chartaceous, oblong to oblong-elliptic, entire, 5 to 8 cm long, 2.5 to 3.5 cm wide, somewhat olivaceous, subequally narrowed to the acute base and to the obtuse or slightly retuse apex; primary lateral nerves 5 to 7 on each side of the midrib, slender, distinct, irregular, arched-anastomosing, the reticulations distinct; petioles 8 to 10 mm long. Racemes axillary, solitary, distinctly pubescent with short, somewhat glandular hairs, 3 to 5 cm long, many-flowered, the pedicels 2.5 mm long, the linear-lanceolate, glandular-punctate, and pubescent bracteoles about 1 mm long. Calyx 1.5 mm in diameter, pubescent, somewhat glandular-punctate, the lobes 5, triangular-ovate, acute, 0.5 mm long. Petals symmetric, oblong-elliptic, 1.8 mm long, obtuse, glandular-punctate especially in the upper half. Filaments slightly pubescent, about 2 mm long; anthers broadly ovoid, 0.4 mm long, rounded or obtuse, the connectives obscurely glandular-punctate. Ovary glabrous.

Hainan, without definite locality, *K. K. Ts'oong 2713.*

A well-marked species belonging in the group with *Embelia tsjeriam-cottam* A. DC., differing in its entirely glabrous branchlets, somewhat smaller, obtuse or somewhat retuse, fewer-nerved, glabrous leaves, in its rounded or obtuse, not acute anthers, obtuse petals, and numerous other details.

A SUPPLEMENT TO POISONOUS AND WORTHLESS FISHES [1]

By Albert W. C. T. Herre

Chief, Division of Fisheries, Bureau of Science, Manila

Just as the page proof of my paper on Philippine plectognath fishes was completed, I obtained a fine specimen of the species described herein, which adds to the Philippine fauna a family hitherto unknown from Philippine waters. All the families of gymnodont fishes are now recorded from the Philippines.

Key to the families of Gymnodontes.

a^1. Caudal fin normally developed, with a distinct caudal peduncle.
  b^1. Pelvis very long, ribs well developed; upper jaw divided by a median suture, lower jaw undivided..... **Triodontidæ.**
  b^2. Pelvis and ribs obsolete.
    c^1. Upper and lower jaws each divided into right and left halves.
      d^1. Back broadly rounded; head broad; nostrils various; frontal bones united with supraoccipital..... **Tetraodontidæ.**
      d^2. Back more or less sharply ridged; nostrils obsolete or very small; frontal bones separated from supraoccipital by the postfrontals which meet in the middle..... **Canthigasteridæ.**
    c^2. Upper and lower jaws each entire; the premaxillary and dentary bones grown together, forming jointless arches; maxillaries extended laterally behind; body covered with stout rooted spines. **Diodontidæ.**
a^2. Body cut off behind dorsal and anal without a caudal peduncle and with caudal region aborted; jaws not divided..... **Molidæ.**

TRIODONTIDÆ

This unique family, belonging to the suborder Gymnodontes, is composed of but a single genus with only one known species, and is easily separated from all related groups by the peculiar teeth and body covering and the saclike abdomen. The teeth of the upper jaw are divided by a median suture into equal right and left halves, but those of the lower jaw form a single undivided plate. The whole body is covered with small, bony, spiny, scalelike plates which are more or less overlapping. The abdomen can be dilated into an enormous, laterally compressed, pendant bag which is kept expanded by the very long pelvic bone; the lower part of the sac is only a flap of skin into which the air does not penetrate. The skeleton is bony, with well-

[1] Philip. Journ. Sci. 25 (1924) 415.

developed ribs. The head is deep and narrow, very strongly compressed laterally; the body is likewise compressed, with short dorsal and anal fins placed far back; the tail is long, at first subcylindrical but soon strongly compressed dorsoventrally, and ends in a medium-sized forked fin; there are two nostrils on each side, situated close together and very high up and far back on the snout.

This family is intermediate between ordinary fishes and the other families of gymnodonts.

Genus TRIODON Reinwardt

Triodon Reinwardt, CUVIER, Régne Anim. 2d ed. (1829) about 390; "Disciples' edition" (1836) 340.

The characters of the genus are included in the family description given.

Triodon bursarius Reinwardt.

Triodon bursarius Reinwardt, CUVIER, Régne Anim. 2d ed. (1829) about 390; "Disciples' edition" (1836) 340, pl. 112, figs. 1, 1*a*; BLEEKER, Atlas Ichth. 5 (1867) 84, pl. 214, fig. 1; GÜNTHER, Cat. Fishes Brit. Mus. 8 (1870) 270; DAY, Fishes of India (1878) 698; JORDAN and SNYDER, Proc. U. S. Nat. Mus. 24 (1901) 230.

Triodon macropterus LESSON, Voy. Coquille (1830) 103; Atlas Poissons (1826) pl. 4.

Dorsal rays 10; anal rays 9. Head very large, narrow, and deep, and contained a trifle more than 3 times in length; top of head very broad and bony, widest behind the concave interorbital space and with jutting orbital ridges; profile convex with boldly projecting upper teeth which are not covered by upper lip; eye large, a trifle smaller than length of mouth, and contained 4.4 times in head and 2.4 times in snout which is contained $1\frac{5}{6}$ times in head; depth proper of body 3.9 in length, and depth including the sac 2.6 times in length; caudal fin a little more than half as long as head.

Color in alcohol yellowish brown, with a pinkish shade on belly flap; on upper part of sac and below and behind pectorals on each side a large elongate black spot of irregular shape with a yellowish margin.

This singular fish is here described from a specimen of typical appearance, 336 millimeters long or 394 millimeters over all, obtained at Dumaguete, Oriental Negros. This interesting species, which has not previously been recorded from the Philippines, occurs from Mauritius to Amboina and northward to southern Japan, but is apparently not common anywhere.

BEES FROM SAMAR, PHILIPPINE ISLANDS

By T. D. A. Cockerell and Norma LeVeque

Of the University of Colorado, Boulder

The described species of bees of the Philippine Islands, up to the present time, have been recorded from the following islands. The numbers would be somewhat increased if varieties were included in the statistics.

Luzon	101
Mindoro	1
Batbatan	6
Panay	30
Leyte	9
Negros	11
Mindanao	58
Basilan	2
Palawan	32
Sulu Islands	2

The largest island without records is Samar, so we are particularly glad to report on a collection from that island, obtained by Mr. R. C. McGregor in May to July, 1924. Most of the specimens were collected near Paranas (now called Wright), a few kilometers east of Catbalogan on the western coast; nearly all of these specimens were captured at flowers of *Mimosa pudica* Linnæus, between 8 and 10 o'clock in the morning. The other specimens are from Loquilocon, a barrio of Wright, about 10 kilometers inland and with an elevation of about 250 meters.

Names of plants noted in this paper, except *Mimosa pudica*, are determinations by Elmer D. Merrill of material collected by McGregor.

Although the Samar collection includes, as was to be expected, many species already reported from other parts of the Archipelago, there are several novelties which, as far as known at present, are peculiar to the island.

Nomia iridescens Smith.

Three females on flowers of *Mimosa pudica* Linnæus, at Wright, July 12.

Nomia strigata (Fabricius).

Three females, July 27.

Nomia levicauda Cockerell.

Two females, July 2.

Nomia mimosæ sp. nov.

Female.—Length, about 10 millimeters; anterior wing, 7.3; robust, black, the first four abdominal segments with rather narrow but very conspicuous, shining, entire, light orange tegumentary bands; no ferruginous color on head, thorax, or abdomen; hair of head and thorax thin, mainly white, black on scutellum, very thin and short, partly light and partly dark on mesothorax; mandibles black; flagellum dull ferruginous beneath; clypeus and supraclypeal area shining, with a strong median keel continuous from supraclypeal area to clypeus, the latter also with wavy longitudinal sulci; middle of front, below ocelli, dull and appearing minutely granular; mesothorax and scutellum dull, the punctures so minute and close as to be hardly visible under a lens; postscutellum unarmed, covered with cream-colored tomentum; prothorax and tubercles fringed with similar tomentum; base of metathorax with a curved transverse channel, without cross ridges; tegulæ rather large, sharply pointed behind, light rufotestaceous, with a large black spot in front; wings dusky, stigma and nervures fuscous; legs black, with light hair, some dark fuscous on outer side of middle and hind tibiæ; spurs ferruginous; abdomen moderately shining, the punctures very fine and delicate.

SAMAR, Wright (*McGregor*), July 12, 1924; two at flowers of *Mimosa pudica.*

In the key to Philippine species *Nomia mimosæ* falls closest to *N. longitarsis* Cockerell, from which it is easily known by the keeled face and the much more minutely sculptured mesothorax.

Anthophora korotonensis Cockerell.

One male and five females; one female from Loquilocon, May 26; all the rest from Wright, at flowers of *Mimosa pudica*, July 12.

Anthophora whiteheadi samarensis subsp. nov.

Female.—Length, about 14 millimeters; very robust; hair of head and thorax profusely mixed with black, the general effect dark gray, but fulvous about the tubercles and below the tegulæ; on outer side of hind tibiæ mixed black and white, with a large

black patch apically, on inner side black, but along posterior margin of inner side a band of pure white hair, expanding apically; hind basitarsi with black hair, a tuft of white at base posteriorly; light markings of face very dull yellowish, not white; black areas on clypeus very large, so that the median light band is narrow and gradually comes to a point above; scape with a light mark; tegulæ dull coppery red; wings dilute fuliginous; abdomen with four brilliantly shining blue bands, that on first segment much narrower than others, and suffused with green, the others green at sides in some lights, and in some lights appearing more purple in middle.

SAMAR, Wright (*McGregor*), July 12, 1924; one female at flowers of *Mimosa pudica*.

A puzzling form, intermediate between *A. whiteheadi* Cockerell from Luzon and *A. borneensis* Cockerell from Borneo. The tegulæ are as in *whiteheadi*, the bands more like those of *borneensis*. It appears that the latter should be called *A. whiteheadi borneensis*, at least on the basis of our present information. Dover's recent paper[1] on the *A. zonata* group is a valuable contribution on account of the figures of structural characters, but it does not appear probable that all the forms (excluding such species as *subcaerulea*) can be reduced to three species (*zonata, cingulata,* and *walkeri*), each extending from India to Australia, separated on the color of the thoracic pubescence. Dover's dissections show that the various forms he regards as subspecies have structural as well as color characters, and it must probably be said that we do not know enough to be sure of their true relationships with each other. The thoracic hair, known to vary within the species of this genus, is not likely to be a sure guide to affinity. No doubt it will eventually appear that the separable forms of this group are very numerous, and some day they will be properly grouped as subspecies under a comparatively limited number of specific names.

From the Indian *A. cingulifera* Cockerell, the Samar form is separated by the deeper, more intense blue of the abdominal bands; and the distinctly ocherous tint of the thoracic pubescence posteriorly and also in the region of the tubercles (the whole of the light dorsal pubescence being distinctly tinged with yellow). Nevertheless, the relationship appears to be very close, and Dover's contention that *whiteheadi* and *cingulifera* are sub-

[1] The Entomologist No. 737 57 (1924) 226.

species of one species may prove valid. In Dover's key, *samarensis* would go to the Australian *A. cingulata* (Fabricius), differing by the strongly metallic bands and other characters.

Megachile subrixator Cockerell.

Five females at flowers of *Mimosa pudica,* Wright, July 12.

Megachile metallescens Cockerell.

One female at *Mimosa pudica,* Wright, July 12.

Megachile atrata Smith.

One female, Wright, July 12. This must surely be *atrata* of Smith, originally described from the Philippine Islands. However, it is not the species described as *atrata* by Bingham [2] as the clypeus of the Samar insect is quite different, with no median carina. Bingham's species has been separated by Meade-Waldo as *M. atratiformis.* The scutellum of the Samar bee, however, is very coarsely sculptured, and agrees better with Meade-Waldo's account of *atratiformis* than with what he says of *atrata.* The Samar bee agrees with one from Amboina, from F. Smith's collection, determined by him as *atrata.* It is very close to *M. lachesis* Smith, but with paler wings and shining mesothorax. The bee collected by McGregor at Manila, which has been regarded as the female of *M. lachesis nigrolateralis* Cockerell, is this same *M. atrata,* and apparently *nigrolateralis* (based on the male) falls as a synonym.

Lithurgus scabrosus (Smith).

One of each sex, Wright, July 12.

Ceratina philippinensis Ashmead.

One female, at flowers of *Mimosa pudica,* Wright, July 12.

Xylocopa fuliginata Perez.

Eight males, June 13 to July 12; one from Wright, July 12, at flowers of *Mimosa pudica.* Four females from Loquilocon, May 30 to June 4; one, June 4, at flowers of *Melicope triphylla* Merrill.

Xylocopa fuliginata var. **indecisa** var. nov.

Female.—Wings very dark, with brilliant blue-purple colors; posterior part of mesothorax more sparsely punctured; abdomen distinctly green, but the color obscure and only well seen on

[2] Hymenoptera, Fauna Brit. India 1 (1897) 475.

comparison with black. One specimen has a few white hairs on the sides of the thorax, below the tegulæ; the other lacks these.

SAMAR, Loquilocon (*McGregor*), type, June 12, at white flowers of *Donax cannaeformis* K. Schumann; another specimen, May 31.

This form caused a great deal of trouble, because of its composite relationships. The color of the wings is not so rosy purple as in *X. collaris,* yet much more like that than typical *fuliginata,* of which Perez says: "Ailes beaucoup plus sombres, brunes avec de très faibles reflets d'un bleu violacé." The small amount of hair at sides of thorax of one specimen marks an approach to *collaris,* and the sparsely punctured posterior part of mesothorax also agrees with that species. The larger size, greenish abdomen, and strong median ridge on the much more closely and less densely punctured clypeus at once separate it from *X. ignita* Smith. Maidl has treated *X. fuliginata* as a synonym of *X. amethystina* "Fabricius," Gribodo, but as Dusmet remarks, it is impossible to identify *amethystina* from the brief description of Fabricius. We can only accept the traditional identification for an Indian species which is certainly not *X. fuliginata.* Dusmet received a bee from Staudinger labeled *X. amethystina,* collected in Palawan. He describes it as a new species, *X. mazarredoi;* it has the wings without very strong violaceous color, and is otherwise quite distinct from the variety now described. Meade-Waldo, in the British Museum collection, placed *X. ignita* as a synonym of *amethystina.*

The greenish abdomen of *indecisa* represents an approach to *X. nigrocærulea* Smith, but that differs greatly in the color of wings and punctures of thorax.

Mesotrichia philippinensis samarensis subsp. nov.

Female (*type*).—Pale pubescence on hind part of thorax and base of abdomen reddish yellow, the raw sienna of Ridgway's Nomenclature; wings with the greenish color of the subspecies *chlorina* Cockerell; apical field rosy purplish. There is less white hair on the face than in *chlorina,* the general effect in lateral view being black, with hardly any white. The specimen chosen as the type has the hair arranged practically as in *philippinensis,* the light reddish hair being confined to the sides of the scutellum, except a few hairs along the posterior margin; but occasional specimens have the hair light right across, as in *chlorina.* The type specimen has the anterior wings 18.5 mil-

limeters long. There is a very large robust specimen, with the reddish hair on scutellum reduced to small lateral patches, and the anterior wings fully 22 millimeters; this may be separable when more specimens have been obtained.

Male.—Like the form which Perez described as *X. euchlora,* which is doubtless the male of *X. philippinensis.* There is one male which has a rather different aspect, with the hair of thorax anteriorly suffused with reddish (compare *M. vachali* Perez), and the lateral portions of the apical yellow band on clypeus claviform. Perhaps this is the true male of *samarensis,* and the others are different.

Sixteen females, May 31 to July 12; ten from Wright, July 12, collected at flowers of *Mimosa pudica.* Others at flowers of *Fagraea racemosa* Jack. and *Albizzia saponaria* Blume. Four males, May 26 to July 12. The one from Wright, July 12, at flowers of *Mimosa pudica,* is the one with reddish hair on thorax. The others were taken near Loquilocon in May and June.

Xylocopa maesoi Dusmet, from Tayabas and Dolores, is certainly a form of *M. philippinensis,* not appreciably differing from *chlorina.*

Mesotrichia canaria sp. nov.

Female.—Length, about 23 millimeters; anterior wing, 21; distance between wings, 9. Robust, with the light hair of thorax light canary yellow. Very much like *M. ghilianii* Gribodo, but smaller; the wings a beautiful green, practically without purple; the yellow of thorax above more extensive, with a conspicuous line above tegulæ, so that the disk of mesothorax has a very large subquadrate black patch, broader than long, its outline more or less trilobed posteriorly, the middle lobe the largest; extreme base of wing a tuft of yellow hair (a black tuft in *ghilianii*); first abdominal segment with the yellow hair becoming thin and evanescent posteriorly (covering the segment in *ghilianii*); abdomen much less densely and roughly sculptured, the surface shining, not conspicuously hairy; face with a little light hair among the black, and cheeks with very light hair anteriorly. The ocelli are much smaller than in *M. ghilianii.* In both species the clypeus has a conspicuous median smooth line or band.

This is perhaps still nearer to *Mesotrichia nigroplagiata* (*Xylocopa nigroplagiata* Ritsema), from the Aru Islands, but the Samar insect is larger and has a large yellow area on pleura as in *M. ghilianii.* The color of the wings is also different, and

the hair on the cheeks differs. It is not impossible that the greenish-haired males referred to above, having the appearance of *X. euchlora,* really belong to *M. canaria.*

SAMAR, Wright (*McGregor*), July 12, 1924; twenty-one females collected at flowers of *Mimosa pudica.* A very handsome species.

Mesotrichia ghilianii Gribodo.

Twelve females, May 22 and May 26, many at flowers of *Fagraea racemosa* Jack.

Trigona biroi Friese.

Eighteen workers, May 21 to July 4. They were taken at Loquilocon, at flowers of *Citrus;* at Wright, at flowers of *Mimosa pudica;* and one specimen at flowers of *Melicope triphylla* Merrill.

Apis binghami Cockerell.

Thirty-five workers, May 31 to July 12, from Loquilocon and Wright.

Apis indica nigrocincta Smith.

Twelve workers, May 31 to July 12; Loquilocon, at *Aspidopteris elliptica* Jussieau; Wright, at *Mimosa pudica.*

DIPTERA OF MEDICAL AND VETERINARY IMPORTANCE, I

TYPES OF OLDER AUTHORS IN CONTINENTAL MUSEUMS

By W. S. Patton

Of Edinburgh University

In several recent papers I have recorded my studies of Walker's and Bigot's types of *Musca* and certain of the Calliphorinæ of the former. As a result of this work it has been possible to clear up a large amount of synonymy, and at the same time to settle the identity of many of the species described by these authors. Further work on the revision of the species of the genus *Musca* had, however, to be abandoned until I had an opportunity of examining the types of Fabricius, Wiedemann, Macquart, Loew, Thomson, Stein, Karsch, Schiner, Bezzi, Villeneuve, and others, in various public and private collections on the Continent. A grant from the Earl of Moray Fund for Original Research of Edinburgh University, however, made this possible, and I wish to take this opportunity of thanking the trustees of the fund for this grant. As I collected a large amount of information regarding the various collections, particularly those of the Diptera, and also examined many types, it has occurred to me that some of my notes may be of use to others. At the same time I will take this opportunity of dealing with some Diptera of medical and veterinary importance.

Although the main object of the tour was the study of the existing types of the Muscinæ and Calliphorinæ, I went prepared to examine the types and specimens of any insects directly or indirectly concerned in the transmission of disease-causing organisms to man and animals.

For an extensive tour of this nature to be successful it is first necessary to be certain of the whereabouts of the various collections containing the types to be examined; and this necessitated a large amount of correspondence with directors of museums and others in charge of dipterological collections. I am particularly indebted to Professor Bezzi for the very complete and, as it proved, accurate information regarding the

whereabouts of the collections containing the types of the authors mentioned above. Having gained all this information it was possible to plan my route so as to minimize the time which must of necessity be spent in traveling.

When one sets out to examine types, particularly those of the older authors, and expects to do so in the minimum of time and with the certainty of arriving at their identity, it is most important to take with one specimens believed to be conspecific, and not to trust to one's memory. The specimens can thus be examined side by side with the types and, if found to be identical, can be so labeled. A good binocular microscope is a necessity. Prepared in this way it is possible in a very few minutes, and often with only one examination, to arrive at a final conclusion regarding the identity of the type.

Several months were spent in making notes and bringing together conspecific specimens, several hundreds of which were taken. I left Edinburgh on July 19, 1922, for Hamburg where I spent two days before going on to Kiel. I had an opportunity of going through the Institut für Schiffs- und Tropen Hygiene, and of examining the material used in teaching medical entomology and parasitology. Doctor Meyer, whom I met several years ago in Madras, spent the best part of a day showing me this fine institution, where the German medical graduate has an opportunity of studying tropical diseases, tropical parasites, and their arthropod carriers. The museum contains a very rich collection of pathological specimens illustrating the various diseases of the Tropics, and the parasites and their carriers are extremely well displayed. A large number of them had been collected by Doctors Fülleborn and Meyer during their world tour, and it was interesting to see again among them specimens which had been obtained at Madras. The diagrams and illustrations used for teaching purposes and the very complete set of lantern slides were most instructive. The insect rooms, where tropical insects such as *Stegomyia fasciata* and tsetse flies are hatched out and kept alive, were of special interest. The housing of the animals used for experimental purposes is very complete, and each investigator has a room where his special animals are kept. The arrangements and fittings of the work rooms, and the library in particular, gave one the impression that the minutest details had been thought out in planning this institution. I had an opportunity of meeting and discussing many problems of mutual interest with several members of the staff, especially Doctor Martini and Madame Sikora. I wish to take this opportunity

of thanking Professor Nocht and Doctor Meyer for their kindness in showing me so much of interest in so short a time.

KIEL

I had long looked forward with keen interest to examining the Fabrician collection of Diptera, and was full of hopes of settling once and for all the identity of many of the species of which I have long been in doubt. Anyone who has attempted to identify the species of Fabricius, *Musca nebulo* for instance, from the meager descriptions will know how impossible it is to be certain of their identity in the absence of the types. The description of *nebulo* would apply to many of the Oriental species of the genus, and the locality, in this case at any rate, is of no use.

The largest part of the entomological collection of Fabricius is preserved in a room in the Museum of the Zoölogical Institute of the university of which Geheimrat Professor Doctor Brandt is the director. As far as I am aware no dipterologist has within recent years examined the Diptera in the collection. When Doctor Reibisch, who kindly showed me the collection, produced the boxes containing the Diptera my hopes were dashed to the ground, for the whole of this valuable and historical collection is destroyed, and there now remain only pins, labels, and débris. Fabricius evidently pinned his specimens on beeswax, which had become caked and cracked together with the floors of the boxes, with the result that beetles and other destructive insects had found their way in and had destroyed the specimens. Doctor Reibisch told me that the collection had been in this condition for a long time, but for how long he did not know. The type of *Musca nebulo* is completely destroyed, but there was enough of *Musca megacephala* left to enable me to identify it as the well-known Oriental species *Chrysomyia dux* Eschscholtz (*flaviceps* Macquart).

It will be remembered that Fabricius stated he obtained the type of *megacephala* from Doctor Ifert from Guinea, West Africa, and yet the specimen is that of a species which to my knowledge has not been recorded from any part of the Ethiopian Region (there is one specimen in the British Museum collection from Reduit, Mauritius). Both Professor Bezzi and Doctor Villeneuve told me that they had never seen a specimen from Africa. On examining the label bearing the name *megacephala* in the handwriting of Fabricius, I noted that he had written the words, "Ex. Ind. Or.," on the reverse side, clearly showing that the type came from India, not from Africa. Professor Bezzi

drew my attention to the fact that the type had been given to Fabricius by a medical man, and suggested the possibility of it being the important Old World myiasis-producing calliphorine *Chrysomyia bezziana,* so that it was important to make certain of the identity of this type. I have no hesitation in saying that the type of *megacephala* is the common bluebottle of the Oriental and Australian Regions. Although I have not seen the type of *dux,* and do not know whether it still exists, I have seen the type of *flaviceps,* and note that it is identical with *dux.* This is, however, one of the exceptional instances in which it is possible to be certain of the identity of a species from the description alone, for both Eschscholtz and Macquart clearly state that the males of their species have a large faceted area on the eyes, and this is of course a striking characteristic of the male of *megacephala.* As a result of my examination of the type of *megacephala* and the discovery of the region from which it came, it is quite clear that this is only another locality mistake, a common occurrence in Fabricius's dipterological writings. The following is the complete synonymy of *megacephala;* the names marked with an asterisk indicate that the type has been examined.

Chrysomyia megacephala Fabricius.

Chrysomyia (*Musca*) *dux* Eschscholtz.
Chrysomyia (*Lucilia*) *flaviceps* Macquart.*
Chrysomyia (*Musca*) *remuria* Walker.*
Chrysomyia (*Musca*) *bata* Walker.*
Chrysomyia duvaucellii Robineau-Desvoidy.
Chrysomyia (*Lucilia*) *javana* Schiner.*
Chrysomyia (*Lucilia*) *dives* Bigot.*
Chrysomyia (*Lucilia*) *saffranea* Bigot.*
Chrysomyia (*Somomyia*) *pfeifferi* Bigot.*
Chrysomyia (*Somomyia*) *erythroopina* Bigot.*
Chrysomyia (*Lucilia*) *cyaneocincta* Bigot.*
Chrysomyia (*Lucilia*) *cyanescens* Loew.*

I have no doubt that Robineau-Desvoidy described this species several times, but it is not possible to be certain of his species in the absence of the types, and these are all now lost. Unfortunately, there are no other types left in the original Fabrician collection which could possibly be identified, and were it not that Wiedemann studied the specimens when they were still in good preservation many of the species of Fabricius would have to be finally deleted from the literature as unrecognizable. In this connection it is interesting to note that, as Wiedemann points out, Fabricius had not a single specimen of *Musca domestica*

Linnæus, labeled by him as such in his collection; and I could not find a pin with any label *Musca domestica* in Fabricius's handwriting. Wiedemann says that *Musca ludifica* Fabricius, which is generally regarded as a synonym of *corvina* Fabricius, is nothing more than a female *domestica* Linnæus. Wiedemann further points out that the types of *M. corvina* and *M. umbraculata* Fabricius at Kiel and the cotypes at Copenhagen are also *domestica*. I have no doubt regarding the specimens at Copenhagen. *Musca corvina* Fabricius, *M. ludifica* Fabricius, and *M. umbraculata* Fabricius must therefore be included in the synonymy of *domestica* Linnæus in the future.

Doctor Reibisch showed me a few of Fabricius's types of the Tabanidæ, which had been incorporated in the museum collection. It was very easy to recognize among these types the species *Tabanus striatus, T. javanus, T. borealis, H. roralis, Calliphora dispar* Macquart, *C. pellucidus*, and *P. amboiensis*, all of which are in good preservation.

The types of Microlepidoptera and most of the Coleoptera are in good preservation, but most of the species of the other orders described by Fabricius, as well as many arthropods, are destroyed. Some of the types of the Coleoptera are in Glasgow, Doctor Reibisch told me.

COPENHAGEN

The Zoölogical Museum of the University of Copenhagen contains a number of valuable entomological collections, those of the Diptera named by Fabricius and by Wiedemann being the more important. Although Doctor Lundbeck was not in Copenhagen at the time of my visit, Mr. Henriksen kindly gave me access to these collections.

Wiedemann's work on the exotic Diptera is of importance, not only because of the excellence and the accuracy of his descriptions, but also because he examined the types and cotypes of Fabricius and had access to the large and important collections of Westermann, Trentepohl, and von Winthem, and also to types in Berlin (Hoffmannsegg), Frankfurt, and Leyden. However, though Wiedemann enjoyed many advantages over Robineau-Desvoidy and Macquart in being able to examine so many types and specimens of a given species, like all these old authors, he does not appear to have seen a really good series of any of the exotic species he described. Yet Wiedemann made very few mistakes, and showed himself to be a master of his subject; no dipterologist can afford to ignore his species.

All the specimens at Copenhagen are in excellent preservation, and I was able to determine them accurately. Doctor Villeneuve, it will be remembered, has already examined some of the types of Calliphorinæ and Tachininæ. The following notes on some of the species may be of interest:

FABRICIAN COLLECTION

Musca megacephala Fabricius (three females).

One of the specimens bearing the label *megacephala* is the well-known African species described by Wiedemann under the name *putoria*. The second without any label is the species *Lucilia pulchra* Wiedemann, and the third is the true *megacephala*. In his examination of two of these specimens Doctor Villeneuve was apparently under the impression that they were the types of *megacephala*, whereas they are hardly even cotypes; the type of *megacephala*, or what remains of it, is at Kiel. Villeneuve came to the conclusion that *megacephala* referred to by Bezzi from Africa was not the *megacephala* of Fabricius, but a distinct species, which he named *bezziana* without, however, giving a description of it or specifying any type. Professor Bezzi considers the specimens he has at Turin are the types. When at Turin I compared Indian specimens with them.

Musca sacra Fabricius.

Villeneuve has already pointed out that this calliphorine, said to have come from the Cape of Good Hope, is obviously not an African species, the eyes being densely hairy. This is another locality mistake made by Fabricius, for the specimen is a typical example of *Calliphora quadrimaculata* Swederus; *sacra* then becomes a synonym for this species.

Musca jejuna Fabricius (three females).

One of the specimens is not conspecific with the other two. I note Surcouf appears to have had one of these sent him when he was preparing his Revision des Muscidae Testaceae. It is by no means certain which specimen he had. Here again I would like to point out that the type of *jejuna* was at Kiel, and Surcouf rather arbitrarily assumes that the specimen sent him from Copenhagen is the type. Wiedemann examined the types at Kiel and pointed out that the specimens from Bengal were more typical, those from Tranquebar having been faded when he saw them; therefore it is much more important to examine Wiedemann's specimens than those of Fabricius at Copenhagen, because there is very little doubt that he would have compared

his specimens with the types. Two of the specimens are identical with the *jejuna* in Westermann's collection; the third is the species known as *Bengalia lateralis* Macquart, and this is identical with the specimen labeled by Wiedemann *Musca jejuna* var., Tranquebar. This is a good example of the great care which should be observed in examining the types of the older authors.

Musca nebulo Fabricius.

The two specimens, a male and a female, are hardly even cotypes; the latter is a typical specimen of *sorbens* (*humilis*), the former the Indian house fly known as *nebulo*. The type of *nebulo* was at Kiel, but as already noted is now destroyed. Fabricius confused all the species of *Musca* sens. str. he examined, and it is therefore not surprising to find him confusing these two. What his type of *nebulo* was, it is now impossible to be certain; but it is clear it may have been one or other of these two species. I do not see any use in now changing this name, and shall continue to call the Indian house fly *nebulo*.

Musca stygia Fabricius.

The cotype, a female without a label, but said to have come from Newfoundland. Schiner pointed out that this is a locality mistake, the specimen having in all probability come from New Zealand. It is a specimen of the well-known golden-haired blowfly of the Australian Region, variously known as *Pollenia villosa* Robineau-Desvoidy, *Musca australis* Boisduval nec Macquart, and *Musca laemica* Walker.

In the collection I also noted two specimens of *Lucilia pulchra*, labeled by Fabricius "affinis *megacephala*," and one male specimen of *megacephala*, labeled "Ex Ind. Or."

WESTERMANN'S AND TRENTEPOHL'S COLLECTIONS

Musca megacephala Fabricius.

Two males from Batavia are typical specimens of the Fabrician species noted above. It is clear from these specimens that Wiedemann had no doubt regarding *megacephala* from the Oriental Region, having seen the type. However, with these two specimens is a third, from Guinea, which is a male of *putoria* Wiedemann; there are also a male and a female, from Guinea, of *putoria*. It is evident that Wiedemann was on the lookout for *megacephala* from West Africa, but it is surprising to find he confused one of his own species with the Indian *megacephala*, which is a very distinct fly.

Musca marginalis Wiedemann.

Typical specimens of this well-known blowfly of the Ethiopian Region; the type is in the collection at Vienna.

Musca chloropyga Wiedemann.

A female from the Cape of Good Hope and two other specimens from St. Helena; this is the well-known Ethiopian species with dark wing base and the characteristic presutural thoracic stripes.

Musca viridaurea Wiedemann.

The male from Batavia is a species of *Thelychaeta* Br. and Berg. It is not an uncommon species in the hill stations of India, where it may be mistaken for a *Chrysomyia*. The type is in the Vienna collection.

Musca munda Wiedemann.

The type, a female from Batavia, is a female of *viridaurea*, which is the older name.

Musca planiceps Wiedemann.

The type, a male from Java, is the Oriental species *Musca cingalaisina* Bigot. Van der Wulp, Catalogue of the Described Diptera from South Asia, places this species in the genus *Cyrtoneura* Macquart (*Muscina*), a determination which was evidently made from the description.

Musca mediana Wiedemann.

A cotype, a male from China, is a small specimen of the species recorded by me under the name *Musca albomaculata* Macquart (*dorsomaculata* Macquart; *convexifrons* auctores nec Thomson; ? *setigera* Awati). The type of *mediana* is in von Winthem's collection at Vienna, and the specimen which I now have before me is not this species but is *sorbens* (*humilis*), so that *mediana* becomes a synonym of *sorbens*.

Musca xanthomelas Wiedemann.

The type, a female from Java, is the female of *mediana* in this collection, and is now the correct name for the species recorded under the name *albomaculata* mentioned above. It must not be confused with *Musca xanthomela* Walker, which name sinks as a synonym for *ventrosa* Wiedemann; there is, therefore, no necessity to change Wiedemann's name.

Musca humilis Wiedemann.

The cotype, a male from China, is *sorbens* Wiedemann; the type of *humilis* is in the Vienna collection.

Musca latifrons Wiedemann.

The type, a female from Macao, is a specimen of *sorbens;* a small female is also this species.

Musca lusoria Wiedemann.

Two males, the type and cotype, from the Cape of Good Hope. This is the common African species with four well-separated thoracic stripes; vein R_{4+5} has small bristles all along its ventral surface. The first abdominal tergite is black; the second has a narrow black median stripe with some dark patches on each side of the middle line of the anterior border, and well-marked silvery admedian stripes; the third tergite is brown with a dark median stripe and silvery admedian ones, the lower border has a dark band of varying width.

This species is widely distributed in Africa and has a white puparium like the Oriental *Musca bezzii;* it has been frequently confused with *Musca autumnalis.* I have not seen a specimen of *autumnalis* from any part of Africa.

Musca cuprina Wiedemann.

The type, a female from China, is the species of *Lucilia* known as *argyricephala* Macquart (*serinissima* Walker).

Musca ligurriens Wiedemann.

The type, a male from Java, in Trentepohl's collection is the Oriental race of *Chrysomyia albiceps* var. *putoria;* it is certainly not a *Lucilia* as stated by Brauer.

Musca lauta Wiedemann.

The type, a female, is the common Oriental and Australian *Cryptolucilia* (*Pseudopyrellia*) *lauta.*

Space will not permit of my dealing with any other types examined at Copenhagen.

STOCKHOLM

The Natural History Museum is situated in the country, a little outside Stockholm. The whole of the upper floor of this fine building is devoted to entomology; each of the more important orders has a room to itself, and the arrangements for housing the various insects are complete and up to date. This section of the museum contains many valuable entomological collections, and is particularly rich in coleopterous material. Among others, it contains types of Boheman (Cassididæ), Stål (Chrysomelidæ), Aurivillius (Cerambycidæ), Schönherr and

Chevrolat (Curculionidæ), Salberg (Vega Expedition), De Geer, Paykull, and Sjöstedt (Cameroons and Kilamandjaro Expeditions), and Mjöberg (Australian Expedition); there are many types of other orders as well. The collection of Diptera contains the important types of Thomson (Fregatten Eugenies Resa) and those of Speiser and Sjöstedt (Cameroons and Kilamandjaro Expeditions).

The true identity of the species of *Musca* described by Thomson has long been a puzzle to me and it was very gratifying to find them in such good preservation, and the whole collection so well arranged that it was easy to identify them. I wish to take this opportunity of thanking Professor Sjöstedt for giving me access to these collections, and for showing me so much of interest in his department. The following notes on some of the types examined at Stockholm may be of interest:

Musca convexifrons Thomson.

The type and only specimen, a male, is the well-known Australian species *Musca fergusoni* Johnston and Bancroft (*Musca australis* auctores nec Macquart, nec Boisduval). The Oriental species which I have long called *convexifrons* is now *Musca xanthomelas* Wiedemann, a quite different species. I do not know who is responsible for determining this common hæmatophagous Australian species as *australis* Macquart, because the specimens named *australis* in Macquart's collection at Paris are nothing more interesting than *domestica* Linnæus. The name *australis* must now be added to the already long list of synonyms of *domestica*.

Musca bivittata Thomson.

The type is a specimen of *sorbens* Wiedemann, as already noted by Stein.

Musca niveisquama Thomson.

The type, a male, is the species *vetustissima* Walker; the two females from the Moluccas are also this species; but two males from the Moluccas, one of which is labeled *domestica* by Austen, are both the Indian *nebulo*. Evidently one of these specimens was sent to Stein, who labeled it "*domestica* L., var. fronte angusta." Neither of these two specimens is conspecific with the type of *niveisquama;* this name now becomes a synonym for *vetustissima*. I had previously recorded this species under the name *Musca pumilla* Macquart, but as I could not find any types or named specimens of *pumilla* in Macquart's collection at Paris

I have decided to drop this name, Macquart's species being quite unrecognizable from his description alone.

Musca angustifrons Thomson.

The type, a female from Ascension Island, is a typical specimen of *sorbens,* as already pointed out by Stein; another specimen, from Celebes, is also this species. However, two females from Celebes and one male from Ascension are *vetustissima.*

Musca flavinervis Thomson.

The type, a female from Ross's Island, is a specimen of *Musca vicina* Macquart. I propose to adopt this name for the species I have noted as *Musca domestica* atypical in my Notes on the Oriental Species of the Genus Musca. The types of *vicina* are typical specimens of this widely distributed tropical house fly; *vicina* is the oldest name of which the type still exists.

Musca lasiopthalma Thomson.

The type is a specimen of *Musca interrupta* Walker, and the name becomes a synonym for Walker's species, as suggested by Bezzi.

SJÖSTEDT'S KILAMANDJARO COLLECTION

It will be remembered that Speiser described the Muscidæ in this collection; among them I noted the following:

Calliphora parasacra Speiser.

The type and another male are typical examples of the African species *C. croceipalpus* Jaenn. (*vicarians* Schiner).

Several specimens of *Musca* determined by Speiser as *spectanda* Wiedemann are not that species but are *Musca lusoria* Wiedemann. A female included with these is an example of *Musca gabonensis* Macquart (*aethiops* Stein). The male labeled *Musca corvina* F., is certainly not that species but is also *Musca gabonensis* Macquart (*aethiops* Stein).

I also had an opportunity of examining that curious species of *Stomoxys, ochrosoma* Speiser, a yellowish fly with a long yellow proboscis. I also took the opportunity of studying the adult of *Gyrostigma* (*Spathicera*) *meruensis* Sjöstedt, which was bred from a larva recovered from the stomach of the black rhinoceros.

BERLIN

The dipterological collections in the Zoölogical Museum of the University in Invaliden Strasse is one of the most important in

Europe, as it contains many valuable types and specimens determined by Loew, Karsch, Grünberg, Enderlein, and others. I spent a week examining a large number of the specimens, but it would take the best part of a year to work through these immense collections; Doctor Enderlein told me he had as yet been able to sort out only a few of the undetermined specimens, as he had been in charge of the Diptera only about two years. Anyone making a serious study of the Diptera, and particularly the Muscidæ and the Tabanidæ, should certainly pay a visit to this museum. It contains Loew's celebrated collection which is still kept separate and is intact. The collection of Tabanidæ is the largest I have had the opportunity of examining; it is very rich in Ethiopian, Nearctic, and Neotropical species. With this material at hand Enderlein has been able to publish his new classification of the Tabanidæ. Enderlein's collection of European species of *Simulium* and their early stages is a very complete one, containing long series of the different species. I am much indebted to Dr. Günther Enderlein for all the trouble he took in searching out specimens I particularly wished to see. A few notes on some of the more important types and specimens may be of interest.

Musca pungoana Karsch.

The type, a female, is the well-known *M. ventrosa* Wiedemann.

Musca lucidula Loew.

The type, a female, is the metallic species of this genus in which cell R_5 is closed at the margin of the wing.

Musca fasciata Stein.

The types of this species from the Seychelles are in the British Museum, but there are many males and females at Berlin labeled types by Stein. The male of this species has two broad thoracic stripes, but in some specimens I noted that they are divided before the suture; in the female there are four stripes. In both sexes the first abdominal tergite is black, and there are some dark basal bands on the second and third tergites.

Musca crassirostris Stein.

The types of this species are, I understand, in Professor Becker's collection, but those of *Musca inferior* Stein and *M. pollinosa* Stein are at Amsterdam. There are several specimens of *crassirostris* in Berlin determined by Stein. I have no doubt therefore regarding the identity of this species. Professor de

Meijere kindly sent me the types of *Musca inferior* and *M. pollinosa.*

Haematobia lutosa Grünberg.

The type is a male from Kenya Colony; the following is a short description of it: Eyes a little separated, front about one-eighth the width of the eye. Face silvery, epistome wide and prominent. First and second antennal segments reddish yellow, the third mouse gray; the arista has eleven hairs on its dorsal surface and six below; the palpi are almost as long as the proboscis, they are yellow and broadly club-shaped with short, black bristles. Proboscis yellow except the tip which is black. The thorax is dark orange with a broad, ill-defined median dark stripe in front of the suture; postsutural area grayish just in front of the scutellum; sides of thorax yellowish with two bright yellow patches above the middle coxæ; sternopleural bristles arranged 1 : 1. Abdomen mouse gray without any definite markings. Wings with bend of vein M_{1+2} as in the other species of this genus; veins R_{2+3} and R_{4+5} without any bristles at their bases. Legs yellow.

Haematobia nudinervis Stein.

Several specimens labeled types from Formosa by Stein are the species known as *Bdellolarynx sanguinolentus* Austen. The types of *Haematobia rufipes* from Formosa are also this species. As *nudinervis* was described a year before *sanguinolentus,* this common Oriental bloodsucking muscid must in future be known by the former name.

I have now made a careful comparative study of a long series of *nudinervis,* including Stein's types and cotypes as well as many specimens from the Oriental Region, also of *sanguisugens* Austen from many localities in India, of *stimulans* Meigen, and of the type and only known specimen of *lutosa* Grünberg, and have come to the conclusion that the characters used to define the genus *Bdellolarynx* are not of generic value; *Bdellolarynx* is therefore sunk as a synonym of *Haematobia.*

Glossinella shillingsi Grünberg.

There are a number of specimens of this species from East Africa, but they are unfortunately in a very bad state of preservation. This fly is small, grayish, with yellowish legs and yellowish palps; the arista has five hairs on the dorsal side. The abdomen is grayish. I have no doubt that *shillingsi* is a species of *Lyperosia* and is in all probability *L. minuta.*

Stomoxys sellata Grünberg.

The type, a male from North Cameroons, has two broad, black thoracic stripes on a rather bluish gray ground color; the abdomen is brownish yellow.

Stomoxys bilineata Grünberg.

The type, from East Africa, has a grayish thorax with four well-separated dark thoracic stripes, the inner pair better marked than the outer which are almost wanting before the suture. The abdomen is yellowish with dark basal bands on the second and third abdominal tergites.

Stomoxys glauca Grünberg.

The type, from the Cameroons, has two well-marked black thoracic stripes, and a silvery gray thorax; it is probably identical with *Stomoxys nigra* Macquart.

Stomoxys korogwensis Grünberg.

The type has two broad, black thoracic stripes, and a grayish yellow abdomen.

Stomoxys inornata Grünberg.

The type, from the Cameroons, is a dark species with two very broad thoracic stripes in the male; the eyes are rather close together.

Stomoxys brunnipes Grünberg.

A species from the Cameroons; in the female there are two thoracic stripes separated before the suture, but in the male the two stripes are broad. The abdomen has well-marked bands; the face is yellow and the front of the male rather narrow.

Gasterophilus lativentris Loew, from Courland.

The type, a female, is in a bad state of preservation. The abdomen is yellow and the tergites, which are all that is left, are broad and unspotted. The face is reddish yellow, the third antennal segment very short, and the arista straight and thick. The wings are unspotted. I consider it is only a faded, rather pale specimen of *G. intestinalis*.

Gasterophilus nigricornis Loew, from Bessarabia.

The type is a female, and has a whitish yellow thorax and black abdomen with yellowish white hairs. The specimen is not in good preservation and appears to be a rubbed example of *G. veterinus*.

VIENNA

The Entomological Department of the Zoölogical Museum at Vienna contains the valuable and ancient collections of von Winthem and Wiedemann, especially the typical specimens of the latter; also many types of Schiner (Diptera Novara Reise), Doleschall, Brauer, and a large collection of the Muscidæ calypteratæ named by the famous Brauer. At the time of my visit to Vienna the Muscidæ belonging to von Winthem's and Wiedemann's collections were at Treptow where the late Doctor Stein had them at the time of his death in 1921. The Calliphorinæ are at present with Doctor Villeneuve at Rambouillet. Doctor Zerny, who is in charge of the Diptera, promised to send me the types I wanted to see as soon as they were returned from Treptow, and I now have these before me. Some notes on Wiedemann's types of *Musca* as well as some other specimens in the collection at Vienna may be of interest.

On examining the types of *Musca sorbens, M. humilis, M. spectanda,* and *M. mediana,* I find that they are all identical, and *sorbens* is now the oldest and I believe the final name for this species; as I have already pointed out, *latifrons* Wiedemann is also this species. It is interesting to note that Stein had already come to this conclusion and had some time before his death attached the label "*humilis* Wied." to each of the above types. It was very surprising to me to find such a careful worker as Wiedemann describing a single species no less than five times; *sorbens, humilis,* and *spectanda* are described on pages 418 and 419 of volume II of his Aussereuropäische zweiflügliche Insecten. Until now I had considered *Musca spectanda* Wiedemann was the large, hæmatophagous, African species with two broad thoracic stripes, of which *Musca alpesa* Walker is usually regarded as a synonym. *Musca spectanda* now turns out to be a rather small male of the common *sorbens;* the large African species must in future be known as *Musca alpesa* Walker.

It was a matter of great surprise to me that none of the old collections of exotic Diptera which I examined contained a single specimen of *Musca crassirostris* Stein, one of the commonest Oriental species. However, in von Winthem's collection which I now have with me there is a female of this species labeled by Wiedemann *Musca inconstans* and, though this species is mentioned in the index of his volume II, without a number, it is nowhere described, and Professor Bezzi tells me he can find no reference to this name in the literature. This name therefore

cannot be used, and the name of the species must remain as *crassirostris*. It is, however, interesting to know that Wiedemann had examined this fly nearly a hundred years ago, and that the identical specimen is still in good preservation, and is a typical example from India.

Musca ventrosa Wiedemann.

The type, a male, with a red label from China, is in von Winthem's collection together with a male from Sumatra and a female from China.

Musca albina Wiedemann.

The type, a female from India, is also in von Winthem's collection. Recently I found three specimens of this fly in Colonel Yerbury's collection from Ceylon, now in the British Museum. Although I have made very extensive collections of species of *Musca* in India, I never once saw this species. There is only one specimen in the Indian Museum collection from Baluchistan. Wiedemann was evidently doubtful of his species, for on the label he wrote "*albina* Wied., *humilis* ♀ var." *Musca albina* is, however, quite distinct from *sorbens*.

Musca osiris Wiedemann.

The type, a male from Egypt is a typical example of *Musca vitripennis* Meigen. It was of some importance to be certain of this type, because it might quite well have been a male of *albina*.

Musca hortensia Wiedemann.

The type, a male from Java, is the common Indian *Morellia hortensia* Wiedemann.

Musca albiceps Wiedemann and **M. putoria** Wiedemann.

During my visit with Doctor Villeneuve at Rambouillet, I took the opportunity of examining the types of Wiedemann's *albiceps* and *putoria*. It will be remembered that the former was described from Sierra Leone, and the latter from the Cape of Good Hope. These two species are considered to be distinct, the eyes of the male of the former being well separated, those of the latter close together; but these are variable characters, as can be easily noted in any large collections from different parts of Africa. Recently Doctor Villeneuve drew my attention to the presence of a bristle below the mesothoracic spiracle in *putoria* and its absence in *albiceps*. Both types show these characters. I have examined a small collection of *albiceps* from Palestine sent

me recently by Doctor Buxton and, though the majority have no mesothoracic stigmatic bristle, some of the specimens have it on both sides, and yet they are in other respects indistinguishable. I am not in a position to say whether the presence or absence of a single bristle is of importance in separating these two species. The Oriental form has the mesothoracic stigmatic bristle and is identical with *putoria*. *Musca ligurriens* Wiedemann from Java and China is this form. I consider it is best in the meantime to regard *putoria* as a variety of *albiceps*. The Australian form known as *rufifacies* Macquart is identical with the African *putoria* and the Indian form; it has a mesothoracic stigmatic bristle. I shall refer to this species farther on.

The collection of Calliphorinæ at Vienna contains the following, among others:

A number of specimens of the typical *Chrysomyia megacephala* from Canton, belonging to von Winthem's collection; also the same species labeled *flaviceps* Macquart from Singapore, all determined by Brauer. This little collection contains a number of specimens of the Oriental *putoria* along with the typical *megacephala*, clearly showing that Brauer also confused these two species. The collection also contains one specimen of *megacephala* labeled *javana* Schiner (Java), and many labeled *cyaneocincta* Bigot from the Oriental Region; the latter determination is correct, Brauer having seen the type of *cyaneocincta* in Bigot's collection.

Lucilia leucodes Frauenfeld, from Singapore.

This is the species described by Wiedemann under the name *cuprina;* it is an important myiasis-producing species and is identical with *argyricephala* Macquart and *serenissima* Walker.

Lucilia nesiotis Schiner, from Palm Island.

This is one of the common Australian species, and is identical with *Lucilia nosocomiorum* Doleschall from Amboina; Walker described it under the name *marginifera*.

Lucilia pavonia Schiner from the Nicobar Islands is *albiceps* variety *putoria* Wiedemann.

Lucilia ispida Erichson, Australia, is also this species.

Lucilia selasoma Erichson is the well-known Australian *Calliphora augur* Linnæus.

Calliphora hyalipennis Macquart (*ochracea* Schiner) is the somewhat rare reddish yellow blowfly of Australia.

Calliphora aureopunctata Macquart.

I noted that Brauer had attached this name to the bluish Australian species with hairy eyes, yellow stigmata and bases of wings. It will be remembered that Hutton included it under the synonymy of *Calliphora hortona* Walker. The other species, rather similar but with bare eyes and not such markedly yellow stigmata and bases of wings, Brauer determined as *Calliphora aureopunctata* Macquart; Hutton includes this species as a synonym of *Calliphora icela* Walker. An examination of Walker's types of *hortona* and *icela* shows that the two species are identical, and that both are the species named by Brauer *aureopunctata*. I was unable to find any types or named specimens of either of Macquart's species at Paris, but from his descriptions there seems little doubt that the above determinations of Brauer are correct.

In the collection at Vienna I also noted a specimen labeled *rufifacies* Guerin-Meneville det. Loew; it is *Chrysomyia albiceps* var. *putoria*, referred to above.

BUDAPEST

The National Hungarian Museum at Budapest contains many important types, particularly those of Stein's Anthomyiinæ. It also contains the types of Mik's Palæarctic species; some of those of Frauenfeld, the collector of the Novara Reise Diptera; Pokarnz's Alpine Anthomyiinæ, Acroceridæ, and Syrphidæ; some Calliphorinæ named by Hough; and many types of the late Doctor Kertesz, the well-known author of the catalogue of the Diptera of the World. Doctor Kertesz (since deceased) was on his holiday at the time of my visit, but Doctor Csiki spent much time in searching through the collections for the specimens I wished to see. The types of *Musca aethiops* Stein and *Musca dasyops* Stein I heard afterward had not been returned from Treptow where the late Doctor Stein had them at the time of his death. Doctor Kertesz kindly sent them to me shortly before his death as well as many specimens of *Musca* determined by Stein. When I was at Budapest I took the opportunity of examining Professor Hovarth's collection of Cimicidæ and Polyctenidæ. I wish to take this opportunity of thanking both Doctor Hovarth and Doctor Csiki for all the trouble they took in showing me so much of interest.

TURIN

After leaving Budapest, I went to Turin and spent a week with Professor Bezzi examining his types and specimens and working

through all the important species with him. Professor Bezzi has probably the richest private collection of Diptera, and his library is a very complete one. I wish to take this opportunity of expressing my very great indebtedness to Professor Bezzi for placing at my disposal not only his specimens and library, but also his unique knowledge of the Diptera.

I spent a week in Paris examining Macquart's collection in the Entomological Department of the Natural History Museum as well as the collection of testaceous Calliphorinæ used by Surcouf in the preparation of his recent Revision des Muscidae Testaceae. I wish to thank Mons. Seguy for the great trouble he took in searching out this material for me.

I also spent a day with Doctor Villeneuve at Rambouillet and examined his types as well as those of the Calliphorinæ of Wiedemann and Macquart which he has with him at present. It is necessary to note that none of Macquart's types is in a good state of preservation, and I could not find any of the types of Guerin-Meneville.

On my way back to Edinburgh I spent some time in London reëxamining all the types of Walker, as well as those of Bigot, particularly his Calliphorinæ, which Mr. Collin very kindly lent me for study.

The following is a list of the forty-five species of the genus *Musca* known to me at present, with synonyms and notes on some of the species. The types of the species marked with an asterisk have been examined.

Musca domestica Linnæus.

Musca corvina Fabricius.
Musca ludifica Fabricius.
Musca umbraculata Fabricius.
? Musca aurifacies Robineau-Desvoidy.
? Musca riparia Robineau-Desvoidy.
? Musca campestris Robineau-Desvoidy.
? Musca stomoxidea Robineau-Desvoidy.
? Musca campicola Robineau-Desvoidy.
? Musca vagatoria Robineau-Desvoidy.
? Musca hottentota Robineau-Desvoidy.
? Musca vicina Robineau-Desvoidy (nec Macquart).
? Musca rivulans Robineau-Desvoidy.
? Musca pellucens Meigen.
? Musca frontalis Rondani.
Musca minor Macquart.*
Musca australis Macquart.*
? Musca lateralis Macquart.
? Musca chiliensis Macquart.

Musca vicaria Walker.*
Musca antiquissima Walker.*
Musca calleva Walker.*
Musca pampasiana Bigot.*

Musca vicina Macquart (nec Robineau-Desvoidy).

Musca flavinervis Thomson.*
Musca flavifacies Bigot.*
Musca flavipennis Bigot.*
? Musca divaricata Awati.
? Musca analis Macquart.

Musca nebulo Fabricius.

Musca determinata Walker * (nec Patton).
? Musca multispina Awati.

Musca yerburyi Patton.*

Musca incerta Patton * (nec Walker).

Musca sorbens Wiedemann.*

Musca humilis Wiedemann.*
Musca spectanda Wiedemann.*
Musca latifrons Wiedemann.*
Musca mediana Wiedemann.*
Musca angustifrons Thomson.*
Musca bivittata Thomson.*
Musca sordissima Walker.*
Musca euteniata Bigot.*
Musca scapularis Rondani.
Musca dichotoma Bezzi.*
Musca biseta Hough.*
Musca conducens Patton (nec Walker).

Musca vetustissima Walker.*

Musca pumilla Patton (nec Macquart).
Musca minor Patton (nec Macquart).
Musca humilis auctores (nec Wiedemann).
Musca corvina Froggatt (nec Fabricius).
Musca niveisquama Thomson.*

Musca conducens Walker.*

Musca praecox Walker.*
Musca humilis Patton (nec Wiedemann).
Pristirhynchomyia lineata Brunetti.

Musca tempestiva Fallen.

? Musca cuprea Macquart.
? Musca nana Meigen.

Musca gymnosomea Rondani.

Musca tempestatum Bezzi.*

As I have not seen a long series of *Musca gymnosomea* Rondani and *M. tempestatum* Bezzi I am not able to come to a final conclusion regarding their identity. As a result of the examination of a few specimens of *M. gymnosomea* kindly given me by Professor Bezzi I believe it is distinct from *M. tempestatum*. The two species are small flies with two broad black thoracic stripes. The eyes of the male *tempestatum* are closely approximated, the thorax and abdomen are olive green, and the latter has no silvery patches; the first tergite is black; the second is olive green with a broad black median stripe which extends along the upper border of the tergite, and a narrow black posterior band; the third and fourth tergites are mainly olive green; the sternites are dark gray.

Musca fasciata Stein.*

Musca vitripennis Meigen.

Musca osiris Wiedemann.*
? Musca sugillatrix Robineau-Desvoidy.
? Musca phasiaeformis Meigen.

Musca lucidula Loew.*

Musca interrupta Walker.*

Musca lasiopthalma Thomson.*

Musca lucens Villeneuve.*

Musca villeneuvei Patton.*

Musca albina Wiedemann.*

Musca speculifera Bezzi.*
Musca beckeri Schnabl.

Musca albomaculata Macquart.*

Musca dorsomaculata Macquart.*
Musca rufiventris Macquart.*

I am not sure of the identity of this small species from Mauritius Island. I have examined the types and note that in the male the eyes are closely approximated and there are two broad black thoracic stripes; in the female there are four stripes. It may prove eventually to be identical with *M. fasciata* Stein from the Seychelles. I would be glad to have specimens of this species from Mauritius, and hope that those who have an opportunity of collecting fresh examples will do so; it is probably a hæmatophagous fly and would be found around animals in the field.

Musca pulla Bezzi.*

Musca craggi Patton.*

Musca xanthomelas Wiedemann.*

Musca convexifrons auctores (nec Thomson).
Musca albomaculata Villeneuve (nec Macquart).
Musca dorsomaculata Villeneuve (nec Macquart).

Musca ventrosa Wiedemann.*

Musca xanthomela Walker.*
Musca nigrithorax Stein.*
Musca pungoana Karsch.*
? Musca kasauleensis Awati.

Musca pattoni Austen.*

? Musca spinosa Awati.

Musca spinohumera Awati.*

Musca gibsoni Patton and Cragg.*

Musca latiparafrons Awati.*

Musca prashadi Patton.*

Musca bezzi Patton and Cragg.*

Musca mesopotamiensis Patton.*

Musca illingworthi Patton.*

? Musca lusoria Stein (nec Wiedemann).

Musca bakeri Patton.*

Musca hervei Villeneuve.*

Musca terrae-reginae Johnston and Bancroft.*

Musca hilli Johnston and Bancroft.*

Musca convexifrons Thomson.*

Musca australis auctores (nec Macquart; nec Boisduval).
Musca fergusoni Johnston and Bancroft.
Musca lusoria Bezzi (nec Wiedemann).

Musca lusoria Wiedemann.*

Musca dasyops Stein.*

Musca alpesa Walker.*

Musca spectanda auctores (nec Wiedemann).

Musca gabonensis Macquart.*

Musca aethiops Stein.*
Musca congolensis Villeneuve.*

The type, a male, of *Musca aethiops* Stein is identical with the type male of *gabonensis* Macquart in Bigot's collection. The species *M. congolensis* Villeneuve is also this species.

Musca natalensis Villeneuve.*

Musca autumnalis De Geer.

Musca corvina auctores (nec Fabricius).
Musca ludifica auctores (nec Fabricius).

Among the specimens sent me from the Budapest Museum, I find that Stein has confused under the name *lusoria* three distinct species; namely, the true *lusoria* Wiedemann, *autumnalis* De Geer, and *alpesa* Walker. One male from Abyssinia labeled *corvina* Fabricius—by which Stein means *autumnalis* De Geer—is not that species, but is the typical *lusoria* Wiedemann. *Musca autumnalis* never has a row of small bristles along the ventral surface of vein R_{4+5} extending beyond the radio-medial cross vein, but *lusoria* always has. Among the specimens labeled *lusoria* by Stein there are a male and a female of *Musca alpesa* Walker from Scharati and Arusha. In the male of this species there are two broad black thoracic stripes, but in the female they are usually divided into four in front of the suture; sometimes behind the suture the two stripes are divided by a very narrow gray line, but they are never seen as four widely separated black stripes as in *lusoria*. I have seen this species from many localities in Africa; it is only found on animals and in their neighborhood. It is probably oviparous. It would be interesting to know if it has a white puparium.

Musca larvipara Schnabl and Dziedzicki.

Musca corvina vivipara Portschinsky.

Musca planiceps Wiedemann.*

Musca cingalaisina Bigot.*
Musca pollinosa Stein.*
Musca indica Awati.

Musca senior-whitei Patton.*

Musca inferior Stein.*

Philaematomyia gurneyi Patton and Cragg.*
Ptilolepis inferior Stein.

Musca fletcheri Patton and Senior-White.*

Musca crassirostris Stein.

Musca modesta de Meijere.
Philaematomyia insignis Austen.*

Professor de Meijere tells me that his *Musca modesta* is identical with *M. crassirostris* Stein.

The above is a complete list of the species of *Musca* as known to me at present. As I have now studied the existing types of all the species the majority of the names are final; further study of a few species will be necessary before I can be certain of their identity; this will only be possible when fresh material is available.

THE GENUS ANDES STÅL (CIXIIDÆ: HOMOPTERA)

By F. Muir

Of the Hawaiian Sugar Planters' Experiment Station, Honolulu

TWO PLATES

Genus ANDES Stål

Andes Stål, Hem. Afr. 4 (1866) 166, no species mentioned; Oefv. Vet.-Ak. Forh. 7 (1871) 747, *undulatus* Stål described in *Andes*. *Leirioessa* Kirkaldy, Hawaiian Sugar Planters' Exp. Sta. Ent. Bull. 3 (1907) 112, pl. 8, figs. 19–21. Type *L. tortricomorpha* Kirkaldy.

The genus *Andes* was first described by Stål in 1866, but no species was consigned to it until 1871 when *undulatus* was described in that genus. Hence, the genus must date from the last-named year. It stood with the single species until 1923, when I described *Andes oldi*.[1] The present paper lists forty-eight species, including *A. oldi,* which I consider as belonging to the genus; thirty-two of these species are described as new.

The type material of *A. undulatus* Stål in the Stockholm Museum consists of two female specimens which Dr. E. Bergroth kindly compared with specimens from the Philippines, and which I have subsequently examined. It is, therefore, fairly certain that the identification of this species and the generic characters based upon it are correct. *Leirioessa tortricomorpha* Kirkaldy is congeneric with the type of *Andes*. The genus *Cotyleceps* Uhler into which Uhler placed *marmorata* Uhler I consider to be the same as *Pintalia* Stål, which differs considerably from *Andes*.

The abdomen is laterally compressed and the tegmina are large and tectiform, the apical margin wide and rounded, and when at rest they meet. The Sc, R, and M arise separately from the basal cell or from a point thereon, and do not form a stalk. Sc has two branches distad of the stigma and R has three. Mf is about level with the node and M has five apical veins, 1, 1a, 2, 3, 4. Cu forks about one-third from apex of clavus and Cu^{1a} sometimes has a second branch (*undulatus*). The clavus enters the hind margin before apex of clavus. There is no costal area.

[1] Ann. & Mag. Nat. Hist. IX 11 (1923) 553.

This tegmen is the most generalized of the Cixiinæ. In profile the vertex and frons form a curve, except in a few species where the junction is slightly angular and slightly produced; vertex longer than broad, base considerably wider than apex and arcuately and deeply excavate; apex separated from frons by a small carina and there is another small, transverse carina slightly basad of this, thus forming a small fossette at apex of vertex; lateral carinæ deep. Frons long and narrow, base narrow, then gradually widening to beyond middle, then narrowing, apex wider than base, lateral carinæ deep, a median carina on apical portion of frons, median ocellus distinct. Clypeus long, narrow, tricarinate, the lateral carinæ continuous with carinæ of frons. Pronotum short, the lateral carinæ following the outline of the back of eyes and not reaching hind margin. Antennæ small, first segment very short, second segment about as long as wide, in a few species a little longer. Mesonotum tricarinate, slightly compressed laterally. Front coxæ with outer margin straight, subparallel with inner margin, not produced. Hind tibiæ unarmed or with very small spines. Pygofer of female small, as wide as long or longer than wide, bearing wax-secreting glands. Ovipositor complete, large, standing at nearly right angle to pygofer, generally slightly curved dorsad; anal segment fairly small. Male pygofer laterally compressed, medioventral process present, conical or angular in outline, lateral margins slightly curved or angular, symmetrical. Anal segment medium to large, often asymmetrical, anus in apical half. Ædeagus complex, the periandrium large, generally tubular with various processes, one of which is constant in a number of species, but of various size and shape, and is called the cucullus; penis generally small and membranous with or without a flagellum or virga. There is a strongly chitinous tube, the apodeme of the penis, from the base of the penis which passes through the periandrium and is attached to the apodeme which connects the genital styles. The ejaculatory duct passes through this apodeme and joins the base of the penis. Working with dried specimens only, it was not possible to be sure whether the ejaculatory duct opens on the flagellum, when one is present, or on the membranous process referred to as the penis (Plate 1, fig. 18).

The species examined are all very uniform in structure, and many of them are so in color design, so that, apart from the male genitalia, it is difficult to distinguish some of the species. Though a few species are distinctly colored, most of them have a common design which, for convenience, has been figured and

some of the marks named (Plate 2, fig. 28). The work on the male genitalia is of great interest as it shows what profound differences exist therein, in spite of the similar external appearances.

The types of new species have been deposited in the collection of the Hawaiian Sugar Planters' Experiment Station and cotypes, when present, in Prof. C. F. Baker's collection.

Measurements are from apex of head to anus, and from base to apex of one tegmen.

Andes simplex sp. nov. Plate 1, fig. 1.

Male.—Length, 2.7 millimeters; tegmen, 4.3. Head, pronotum, legs, and abdomen light brown; frons darker in the middle, a few darker minute spots on genæ; mesonotum darker. Tegmina hyaline with brown markings, the basal mark from base of tegmen along suture, extending to cubitus and first anal and not reaching to apex of clavus; the subcostal mark extends along the costa from stigma halfway to base, extending across to apex of basal mark where it narrows; a small light spot on costa in middle of subbasal mark, the anterior, basal, and distal margins of subbasal mark darker than the middle; the median mark forming a small line between R and M_{3-4}; the apical cells and extending nearly to median mark fuscous brown, darkest over R apical cells and lightest in middle of Ms; apical cross veins light. Granules small, numerous, brown. Wings light fuscous with brown veins.

Lateral margins of pygofer slightly rounded, entire. Anal segment fairly long, apex forming two small lobes. Genital styles in lateral view subangular in middle, the apex slightly produced. Ædeagus simple, periandrium subtubular, fairly well chitinized, with a spiral constriction in the middle; the penis consists of the membranous process and a long flagellum, the former slightly longer than half the periandrium and slightly chitinized at base, the latter longer than the periandrium and in the specimens dissected coiled around it.

Female.—Length, 3.8 millimeters; tegmen, 5. Similar in build and color to the male but slightly darker.

BORNEO, Sandakan (*Baker*), one male and one female.

Andes decoloratus sp. nov. Plate 1, figs. 2, 3, and 4.

Male.—Length, 3.5 millimeters; tegmen, 5.5. Light brown, darker over mesonotum. Tegmina light brown with very faint markings; the basal mark practically absent; the subbasal re-

duced to two faint, wavy lines from costa to suture near apex, apical cells slightly fuscous, slightly darker at apex of stigma and apices of apical cells; veins same color as membrane with numerous small, brown granules; stigma brown. Wings slightly fuscous with brown veins.

Lateral margins of pygofer roundly produced, no distinct anal angle. Periandrium tubular, simple, the sides membranous, a small, curved spine at base and two others at apex; penis consisting of a small membranous process with a small, curved virga attached to it. Anal segment fairly large, symmetrical, apex rounded. Genital styles in full view flat, basal two-thirds nearly straight, apical third curved outward, subequal in width to the angle, then narrowed to apex; in lateral view basal two-thirds curved, apical third nearly at right angle to base and narrowed to apex, giving it the appearance of the head and neck of a bird.

Female.—Length, 3.5 millimeters; tegmen, 6. Ovipositor about twice the length of pygofer. Much darker and more definitely marked than male. Basal mark extending over cell between cubitus and suture as far as middle, then extending over clavus to hind margin; subbasal mark extending from middle of costa to the apical portion of basal mark, a small clear spot on costal in middle of mark; stigma dark brown; apical cells fuscous, darkest over apical Rs, a small dark spot in apical M_1, M_{1a}, and another over the Cu_1, Cu_{1a} cross veins; veins same color as membrane, granules small, brown, numerous, apical veins with lighter spots; apical cross veins light. Wings slightly fuscous, veins brown.

WEST BORNEO, Mowong (*Muir*), one male and two females, September, 1907.

Andes trispinosus sp. nov. Plate 1, figs. 5 and 6.

Male.—Length, 3.5 millimeters; tegmen, 5.4. In color lighter than female, the pattern on tegmen being greatly faded, so that only the darker edges of the subbasal mark, a mark at apex of clavus, and another at apex of R alone remain distinct.

Lateral margins of pygofer slightly arcuate, entire, anal emargination large and anal angle nearly a right angle. Anal segment long, in dorsal view subparallel-sided to near the rounded apex, anus about middle. Genital styles large, the shape best understood by the figure. Ædeagus with the periandrium tubular, on the right side a small, curved spine arises from near the middle and a larger spine near the apex, from the left side three

large spines with a common base arise at apex; the penis is small, membranous, with a small spine or virga.

Female.—Length, 4 millimeters; tegmen, 5.7. Ovipositor about one and one-half times the length of pygofer, slightly curved; pygofer about as long as broad.

Dark brown, pleura and hind margins of abdominal sternites light. Tegmina with brown markings and hyaline patches; the basal mark covering the Cu and greater part of clavus and joining the subbasal mark, which is produced distally into a point between M and Cu; the median mark is distinct and joins the apical over Cu, apical mark with a curved hyaline mark in apical cells from R to M_3 and a small mark in Sc and R apical cells; veins same color as membrane with numerous small, dark granules; cross veins mostly lighter in dark areas. Wings hyaline, slightly tinged with brown, veins darker brown.

JAVA, Buitenzorg, one male; Roban, one female; Tjibodas, one female (*Muir*).

Andes serratus sp. nov. Plate 1, figs. 7 and 8.

Male.—Length, 3.8 millimeters; tegmen, 5.5. The genitalia are near to *A. trispinosus* but are quite distinct and differ as follows: The lateral margins of pygofer are slightly sinuate and the anal angle is more prominent; the anal segment is shorter with the anus in middle; the genital styles are smaller and differ considerably in outline; the three spines of *trispinosus* form one process with three spines, the apical one with three or four minute teeth on its upper margin; the penis is larger and the flagellum longer; the spine on the right of apex has two prongs; the periandrium is tubular and has a curved spine on right side near middle.

Light brown, slightly darker on frons and between carinæ of mesonotum. Tegmina hyaline, slightly tinged with brown or stramineous, the design faded so that two small brown marks in costal cell, one or two spots in clavus, and a mark slightly distad of apex of costa are all that remain; veins light with numerous small, dark brown granules. Wings hyaline, slightly fuscous with brown veins.

Female.—Length, 3.4 millimeters; tegmen, 5.7. Ovipositor about twice the length of pygofer. From the middle of the hind margin of the pregenital plate (seventh sternite) projects a single small spine.

Dark brown; lighter over lateral portions of pronotum, abdominal pleura, and hind margins of sternites; a darker band on

front femora. The basal mark on tegmina faint; subbasal mark distinct, stretching from the middle of costa to the apical portion of clavus, its distal margin curved and undulating; median mark reduced to a very small mark near fork of $M_{1 \text{ and } 2}$; apical cells fuscous with a lighter mark over R to M_3; veins same color as membrane with numerous small, brown granules. Wings hyaline, fuscous brown with darker veins.

JAVA, Buitenzorg, one male; Doro, one female (*Muir*).

Andes tridentatus sp. nov. Plate 1, fig. 9.

Male.—Length, 3.4 millimeters; tegmen, 5.5. In lateral view lateral margins of pygofer widely subangular, the anal angle distinct, nearly a right angle; anal segment fairly large, anus slightly distad of middle, apex rounded, entire; genital styles widest on apical half, curved, sublanceolate, apex pointed; periandrium tubular, fairly thin, on the right side a short, stout spine about middle and three spines arising from the same base near apex; from the ventral aspect of apex arises a stout process pointing basad about two-thirds the length of periandrium with its apex produced into three stout spines; penis membranous, small, with a long flagellum.

Brown, two or three marks on lateral carinæ of face darker, femora and bases of tibiæ darker. Tegmina dark with distinct design, subbasal mark distinct, from middle of costa to apical portion of cubitus, distal border produced angularly between Cu and M, margins of mark darker than middle, a dark mark at apex of costal cell and over Cu_{1a} beyond clavus; no distinct median mark; apical cells dark brown; veins lighter than membrane with many small, dark granules, apical cross veins light. Wings fuscous brown with darker veins.

Female.—Length, 5.3 millimeters; tegmen, 5.7. Slightly darker than male; ovipositor about one and one-half times the length of pygofer.

BORNEO, Sandakan (*Baker*), one male and one female.

Andes quadrilaminatus sp. nov. Plate 1, figs. 10 and 11.

Male.—Length, 3.5 millimeters; tegmen, 5.5. No distinct anal angle on pygofer, sides arcuate; anal segment fairly long, anus about two-thirds from base, sides subparallel to anus beyond which they converge to apex which is pointed and curved ventrad; genital styles narrow, slightly curved, subparallel-sided, apex subtruncate. A small flange projects on right side of apex of periandrium which is produced into two small spines apically; from apex projects a large, narrow, thin process

like a knife blade with four small, curved teeth along its base; slightly basad arise three smaller processes, two projecting to the left and one projecting basad; penis tubular, membranous, without a flagellum.

Light brown; middle of frons and clypeus, middle of vertex, three marks in front of eyes, and front femora darker brown, lateral portion of pronotum lighter. Tegmina light brown or stramineous, design obscure, the subbasal mark curved from middle of costa to apical half of clavus and only distinguished by the dark basal and apical margins; apical cells light fuscous brown, veins lighter with numerous small, light, inconspicuous granules bearing light macrotrichia. Wings light fuscous with dark veins.

BORNEO, Sandakan (*Baker*), one male.

Andes spinosus sp. nov. Plate 1, fig. 12.

Male.—Length, 4 millimeters; tegmen, 5. Brown; lateral carinæ of frons spotted with darker spots, the sense rings on antennæ dark, middle of pronotum darker than sides, where there are some minute dark spots, middle of mesonotum darker than sides; femora dark brown. Tegmina hyaline, stramineous or light brown; basal mark very small, obscure; subbasal mark forming two irregular lines, the basal one from middle of costa to near apical portion of clavus and the distal one from base of stigma to apex of clavus; apical cells fuscous with two lighter areas, one over apical Sc, the other from apical Rs to apical Cu, wider between $M_{2 \text{ and } 3}$; veins same color as membrane with numerous small, brown granules. Wings fuscous with dark veins.

Lateral margins of pygofer roundly produced; anal segment fairly large, anus slightly distad of middle, sides in dorsal view subparallel to anus, then converging to a pointed apex; genital styles with basal half of outer margin concave, apical half nearly straight, inner margin sinuous, apex rounded; periandrium narrow at base, widest at apex, slightly twisted; there are four long, thin, curved processes all pointing basad and nearly as long as the periandrium, all of which appear to arise from the apex of the periandrium; the penis forms a strong spine at base with a small membranous appendage.

BORNEO, Sandakan (*Baker*), one male.

Andes fictus sp. nov. Plate 1, fig. 13.

Male.—Length, 4 millimeters; tegmen, 5.4. Clypeus, frons, vertex, genæ, mesonotum, and legs light brown, abdomen darker

brown, carinæ of frons and pronotum nearly white or slightly stramineous. Tegmina hyaline with light brown or stramineous design; basal mark light, running from base of clavus to near apex where there is a fuscous line or border; subbasal mark light with a fuscous margin, on the costa a small hyaline mark in middle; apical marks very faint; veins same color as membrane, granules minute, light brown. Wings hyaline, slightly opaque with waxy secretion, veins light brown.

Lateral margins of pygofer subangular in middle. Anal segment large, asymmetrical, the right lateral margin produced more than the left with a rounded production on apical half, anus near middle, apex bluntly pointed. In lateral view genital styles concave on outer margin, convex on inner, subequal in width or slightly wider at apex. Periandrium tubular with six curved spines of different sizes on apical half, the cucullus in the form of a large, flattened spine reaching nearly to base of periandrium; penis small, membranous, flagellum short.

MINDANAO, Butuan (*Baker*), one male.

Andes maculifrons sp. nov. Plate 1, fig. 14.

Male.—Length, 3.5 millimeters; tegmen, 5.5. In general build and coloration this species is like *A. spinosus*, but the genitalia are quite different. The anal segment is larger and more rounded at apex; the genital styles are smaller and the apical half of outer margin is more sinuous. The periandrium is long, slightly flattened laterally, with two longitudinal carinæ, the left one produced into a large cucullus on apical half which is curved to left and triangular, a small spine rises from the left side near apex; the penis is large, chitinous, produced at apex to a slender spine, with a long, straight flagellum or virga arising from the base.

JAVA, Pekalongan (*Muir*), one male, 1907.

Andes ornatus sp. nov. Plate 1, figs. 15, 16, 17, and 18.

Male.—Length, 3.2 millimeters; tegmen, 5. Light brown, darker in middle of mesonotum and pronotum, and on vertex and frons between carinæ, lateral carina light with a few darker marks; legs and abdomen light. Tegmina distinctly colored; basal mark distinct, running from base between Cu and first claval and joining subbasal mark which is also distinct, and running from middle of costa to apex of clavus, a small hyaline mark in middle of band in costal cell, the margins of band darker than the rest. The median mark is a line from base of stigma

to $M_{1.2}f$ and on to middle of $M_{3.4}$; apical cells fuscous with the two characteristic hyaline marks running together.

Lateral margins of pygofer rounded; anal segment not very long, broad, anus slightly distad of middle where the segment is widest, apex round; genital styles narrow, flat, angular in middle, apex pointed. Periandrium stout, strong, a short spine on dorsal and a thinner one on ventral aspect about middle; from the ventral aspect of apex arises a thin, long keel and from the left side of the base of this keel arises a flat process, broad at base and tapering to an acute apex.

SINGAPORE (*Baker*), one male, the type. BORNEO, Pontianak (*Muir*), one male.

Andes pulchellus sp. nov. Plate 1, fig. 19.

Male.—Length, 3.4 millimeters; tegmen, 5. Head dark brown, four light marks on lateral carinæ of vertex and base of frons, a light mark at base of antenna to lateral carina of frons; pronotum and mesonotum dark brown, the hind margin and the lateral portion of pronotum behind the lateral carinæ light; coxæ, femora, and pleura brown, tibiæ and tarsi lighter, abdomen dark brown; pleura and genitalia lighter. Anterior half and basal third of tegmen brown, posterior half from fork of Cu milky white, sending six white radiating marks to costa, the first from near base of costa to base of M, a second incomplete mark from C to Sc, the third from apical third of C to Mf, the fourth from stigma to $M_{1.2}f$, the fifth from apex of Sc to R-M apical cross vein, the sixth from apex of R across apical cells to M_2, two small dark marks in the apical portion of fourth and fifth apical M cells, a small brown mark on margin at apex of clavus, first claval vein white, veins same color as membrane, granules very small and inconspicuous. Wings milky white with white veins.

Lateral margins of pygofer slightly curved, continuous with anal emargination, no anal angle; anal segment fairly large, anus about middle where it is slightly widest, apex rounded. Genital styles curved, apex slightly rounded. Periandrium fairly long, tubular, with a flattened spine at apex on left side pointing basad, forming a narrow, pointed cucullus. Penis small, membranous, flagellum slender, fairly long.

Female.—Length, 3.5 millimeters; tegmen, 5.5. Ovipositor considerably longer than pygofer, curved; similar in color to male.

WEST BORNEO, Mowong (*Muir*), three males and two females, September, 1907.

Andes brunneus sp. nov. Plate 1, fig. 20.

Male.—Length, 3 millimeters; tegmen, 5. Head dark brown, labium lighter, middle and anterior portion of pronotum dark brown, lighter behind lateral carinæ, legs light brown, abdomen darker brown with lighter posterior margins.

Basal mark from base to apex of clavus covering Cu to first claval vein; subbasal from middle of costa where it is wide to fork of Cu where the distal margin projects along Cu_1, then to apex of clavus where it joins basal mark, darkest along margins, a few dark dots in clavus and in space between basal and subbasal marks, median mark small with a few dark spots near it; apical cells slightly fuscous with the subhyaline marks extensive but indistinct; apical cross veins light, the other veins about the same color as membrane, granules very small and inconspicuous.

Lateral margins of pygofer rounded, continuous with anal emargination; anal segment fairly large, anus in apical third, widest slightly basad of anus, sides slightly arcuate, apex rounded. Genital styles angulate slightly distad of middle, apex slightly widened, subtruncate. Periandrium fairly thin, in lateral view dorsal margin slightly sinuous, ventral margin more distinctly sinuous, cucullus small, covering the apical third of periandrium; penis small, membranous; flagellum fairly large.

BORNEO, Sandakan (*Baker*), three males.

Andes furcatus sp. nov. Plate 2, fig. 1.

Male.—Length, 3 millimeters; tegmen, 4.6. Light brown. Tegmina hyaline with the markings faint and indistinct; the subbasal mark from the middle of costa to beyond the fork of Cu, then to fork of claval veins; apical cells faintly fuscous, a few irregular and faint spots over median area; veins slightly lighter than membrane; wings fuscous with brown veins.

Lateral margins of pygofer slightly arcuate, anal angle very slight; anal segment with anus on third fourth, where it is widest, apex round; genital styles widest at apex which is slightly rounded, curved in middle. Periandrium tubular, slightly twisted, the cucullus median size, arising from right side of apex, widest at base, gradually narrowing to apex where it is produced into two small processes; penis fairly large, membranous; flagellum slightly longer than periandrium.

MINDANAO, Iligan (*Baker*), one male.

Andes parvus sp. nov. Plate 2, fig. 2.

Male.—Length, 2.5 millimeters; tegmen, 3.8. Brown; mesonotum slightly darker than head and pronotum. The pattern

on tegmen obscure, the apical two-thirds being more or less infuscate with some darker marks on Cu, veins the same color as membrane, granules brown, those on basal half more distinct and larger than those on apical half. Wings fuscous with darker veins.

Lateral margins of pygofer slightly arcuate, continuous with anal emargination, no anal angle. The anal segment asymmetrical, the right side on apical half being produced considerably more than the left, anus slightly distad of middle, apex round. Genital styles angular in middle, apex subtruncate, subequal in width throughout. Periandrium flattened laterally, in lateral view dorsal margin concavely curved, ventral margin more strongly convexly curved, widest across middle; cucullus median size, the shape best seen in the figure; penis small, membranous, flagellum fairly long.

BORNEO, Sandakan (*Baker*), one male.

Andes stramineus sp. nov. Plate 2, fig. 3.

Male.—Length, 3.3 millimeters; tegmen, 5. Stramineous; lateral portions of pronotum light; front and middle femora fuscous. Tegmina hyaline with stramineous marks, the basal mark from base to apex of clavus extending over the fork of Cu where it is margined with fuscous; the subbasal mark broken up into three spots with fuscous borders, two spots on the costa and one across middle of R and M stalk, the apical half of tegmen light stramineous with some irregular and obscure hyaline spots; veins same color as membrane with very minute and inconspicuous granules the same color as veins. Wings hyaline, slightly obscure with waxy secretion, veins light.

Lateral margins of pygofer slightly arcuate, continuous with anal emargination, no anal angles, anal segment with anus distad of middle, apex rounded. Genital styles bent at right angle in middle, apex slightly rounded, a slight projection on inner margin near base. Periandrium flattened laterally, the ventral margin projecting considerably, more so on basal half where it forms two projections, cucullus fairly large, the apex wide and produced into two short, rounded processes; penis small, membranous, flagellum a little longer than periandrium.

BORNEO, Mowong (*Muir*), one male, September, 1907.

Andes unifasciatus sp. nov. Plate 2, fig. 4.

Male.—Length, 3 millimeters; tegmen, 4.6. Frons and clypeus between lateral carinæ and vertex dark brown, lateral carinæ of frons and clypeus light brown; pronotum in the

middle and anterior to lateral carinæ dark brown, posterior to lateral carinæ white or yellowish; mesonotum dark brown; legs light brown. Tegmina hyaline, stramineous, subbasal mark represented by a thin line across tegmen from middle of costa to near apex of clavus, the line broken at suture; the median mark small, apical cells fuscous with the hyaline marks obscure, apical cross veins light, other veins same color as membrane, granules obscure, same color as veins. Wings fuscous with dark veins.

Anal angle of pygofer rounded, distinct, lateral margins slightly curved; in profile the lateral margin slightly sinuous with a slight round projection near apex, apex rounded, anus about one-third from apex. Genital styles angular in middle, apex slightly widened and slightly rounded. Periandrium flattened laterally especially on basal half which is produced ventrally into an angular process with the apex acute and curved to the right; cucullus fairly large, subtriangular, wide at base, curving to left; penis membranous, small; flagellum nearly as long as periandrium.

BASILAN (*Baker*), one male. There is one female from Dapitan, Mindanao, similar to this male but darker, which I place in the species but do not include in the type material as the male from that locality is possibly distinct.

Andes dubiosus sp. nov. Plate 2, figs. 5 and 6.

Male.—Length, 3 millimeters; tegmen, 4.5. In build and color this is similar to *A. unifasciatus* except that the subbasal mark is represented by two lines, one the distad and the other the basad margin of the mark.

No anal angle to pygofer, the lateral margins rounded. Anal segment fairly long and narrow, sides subparallel, anus about one-third from apex, apex slightly narrowed and truncate; genital styles subangular in middle of inner margin, outer margin concave, apex subtruncate. Periandrium long, produced into a process on left side as shown in figure, cucullus small, curved to left, on right produced into a large, flat, spinelike process; penis submembranous, fairly large, flagellum not so long as periandrium.

Female.—Length, 3.2 millimeters; tegmen, 4.7. In build and color similar to male but darker and the design on tegmina more distinct.

MINDANAO, Surigao (*Baker*), one male, type, and one female; Dapitan (*Baker*), two females.

Andes pseudobrunneus sp. nov. Plate 2, fig. 7.

Male.—Length, 3.5 millimeters; tegmen, 5.4. Brown; darker on sides of clypeus and on mesonotum, a dark band on front tibiæ. The basal mark light, running from along claval suture to apex of clavus; the subbasal mark forming a dark mark on claval cell with a light center and a dark mark at base of stigma; it is broken over median and covers fork of cubitus; apical cells fuscous with the hyaline mark through them; veins light, the granules minute and of the same color as the veins, cross veins and apical cross veins light with the bordering membrane mostly dark, a number of brown spots along R, M, C, and claval veins mostly basad of cross veins. Wings fuscous with darker veins.

Lateral margins of pygofer arcuate, continuous with anal emargination; anal segment fairly small, apex rounded; periandrium cylindrical, slightly twisted and enlarged on apical half; cucullus moderately small and obtusely pointed, penis comparatively large and studded with chitinous teeth, flagellum a little longer than periandrium.

Female.—Very much darker than male, the pattern on tegmina more distinct, and the subbasal mark not so distinctly broken in the middle. Anal segment longer than broad, the ovipositor double the length of pygofer or more.

MINDANAO, Zamboanga, one male and one female, the types; Iligan, one male; Surigao, Butuan, one female (*Baker*).

In color this comes close to *A. brunneus,* but in the ædeagus comes nearer to *A. furcatus.*

Andes brunniceps sp. nov. Plate 2, fig. 8.

Male.—Length, 3.6 millimeters; tegmen, 5.7. Head dark brown, antennæ, thorax, legs, and abdomen lighter brown, slightly darker in middle of pronotum and mesonotum, a small fuscous band on front femora. Tegmina light brown or stramineous, a few dark dots on veins representing the basal and apical margin of subbasal mark with a few other small marks on veins; median mark distinct between R and M_{3+4}, a dark mark across R apical cells and another at apex of R_2 and M_1 apical cells; veins same color as membrane, granules minute, same color as veins. Wings hyaline, slightly brownish, and opaque with waxy secretion, veins brown.

The genitalia are shown in the figure. The cucullus, in the shape of a large, flattened spine, reaches about one-third from

base of periandrium; penis membranous at base, more chitinous on apical portion which is flattened and serrated along edge.

MINDANAO, Kolambugan (*Baker*), one male.

Andes undulatus Stål. Plate 2, fig. 9.

Andes undulatus STÄL, Oefv. Vet. Ak. Forh. 7 (1871) 747.

Male.—The lateral margins of pygofer wide and subangular in middle. The anal segment moderate with the anus in apical third, apex round and slightly asymmetrical, the right side being slightly more produced than the left. Genital styles flat, narrow, angular in middle with a small projection on inner margin at the bend, apex rounded. Periandrium tubular, slightly bent, with a small, curved spine on left side near base; the cucullus fairly large, arising from the right side near apex and curving round to the left, the outer margin sinuous, produced to a fine point apically, penis small, membranous, flagellum long, slender.

Andes marmoratus (Uhler). Plate 2, figs. 10 and 11.

Cotyleceps marmorata UHLER, Proc. U. S. Nat. Mus. 19 (1896) 280.

In profile the head is more conical at junction of vertex and face than in *A. undulatus* Stål; R has four apical veins, M six, namely, 1, a, b, 2, 3, 4; the antennæ are a little longer than broad. Apart from these characters the species is quite typical of the genus.

The genus *Cotyleceps* Uhler, as I understand it, is the same as *Pintalia* Stål and differs considerably from *Andes*.

The genitalia can be best studied in the figures. The cucullus is large, attached to the right apical portion of the periandrium, and folds around to the left; the margin is irregular. When soaked in water the cucullus flattened out as in the figure, but I do not know if it has the power to do so when living. The penis is small and membranous with a long, curved flagellum. My specimens are from Okitsu, Japan (*Muir*), May, 1913.

Andes usitatus sp. nov. Plate 2, fig. 12.

Male.—Length, 3.4 millimeters; tegmen, 5.2. Brown, the outer portion of the pronotum posterior of the lateral carinæ light, the lateral portions of mesonotum lighter than the middle. Markings on tegmina stramineous; the basal mark extends from base to near apex of clavus between first claval and Cu; the subbasal from the middle of costa to apex of basal mark where it projects angularly along Cu, on costa two fuscous spots, and a small one on the veins on basal margin; a dark line borders

the apical portion of basal mark and the angular portion of the subbasal; a small fuscous mark on costa near stigma; slightly stramineous over cross veins; median mark thin, faint; apical cells slightly stramineous with the typical markings a fuscous wedge-shaped mark through middle of R apical cells, faintly fuscous over apical portion of R and M apical cells. Veins same color as membrane, granules minute, same color as veins. Wings hyaline, slightly opaque with waxy secretion, veins brown.

Lateral margins of pygofer arcuate. Anal segment fairly large, asymmetrical, the right lateral margin on apical half produced much more than the left, apex rounded. Genital styles in lateral view subangular in middle, apex subtruncate, slightly expanded and oblique. Periandrium produced ventrally on basal half into two processes, the basal one like a curved flange and the apical one subconical; cucullus quadrate, reaching about the middle of periandrium; ædeagus membranous on basal half, more chitinous on apical half which is flat and slightly serrate on one edge; flagellum slightly longer than periandrium.

Female.—Length, 3.8 millimeters; tegmen, 6. Similar in color to the male, only darker, the design on the tegmen being more brown than stramineous.

MINDANAO, Butuan, two males and one female; Surigao, one male (*Baker*).

Andes serrulatus sp. nov. **Plate 2, fig. 13.**

Male.—Length, 3.8 millimeters; tegmen, 5.4. In general build and color this species is very like *A. furcatus,* which is similar to *A. brunneus* and *A. pseudobrunneus,* only much paler and the design is much more indistinct.

The genitalia are distinct from those in the species just mentioned and are nearer to *A. usitatus.* They can be best understood from the figure. The anal segment is asymmetrical, being produced on the right edge more than on the left. The periandrium is produced quadrately on basal half of ventral margin with a raised flange; the cucullus is in two parts, both quadrate and longer than broad, reaching basad more than half the length of periandrium; basal half of penis membranous, apical portion thinner, narrower, more heavily chitinized and serrated along its margins, more distinctly along one margin.

The female is darker and agrees with the female of *pseudobrunneus,* but the subbasal mark is a little wider and runs into the median design, and the light mark in costal cell between the

subbasal and the mark near stigma is more distinct. Ovipositor about double the length of pygofer.

LUZON, Mount Maquiling (*Baker*), two males; Los Baños (*Baker; Muir*), three females, September, 1915.

Andes mindanaensis sp. nov. Plate 2, fig. 14.

Male.—Length, 3.3 millimeters; tegmen, 4.8. Head dark brown with lighter carinæ; pronotum light brown, darker anterior to lateral carinæ; mesonotum dark brown in middle, light brown at sides, legs brown, abdomen brown. Tegmina light brown or dark stramineous, the subbasal mark represented by two thin, brown marks, curved, from costa to commissure, representing the distal and basal margins, a thin, fuscous line from apex of costa to hind margin across the cross veins, two small marks between R and M_{1+2} and M_{1+2} and M_{3+4}, costal cells fuscous, two darker marks, one from apex of stigma and the other from apex of Sc, meeting at apical cross vein between R and M and bordering apical cross veins to Cu, veins light, granules very minute, same color as veins.

Male genitalia figured. The periandrium is angularly produced on ventral portion of basal half; the cucullus reaches about halfway to base of periandrium; the penis is membranous with small chitinous teeth on apical portion.

Female.—Length, 4.4 millimeters; tegmen, 6. In build and color similar to male but darker and the design on tegmina is more distinct.

MINDANAO, Kolambugan, one male, type; Iligan, one male and three females; Butuan, one female (*Baker*).

Andes angulatus sp. nov. Plate 2, figs. 15 and 16.

Male.—Length, 3.3 millimeters; tegmen, 5. In profile the junction of vertex and frons angular or subconical in outline, and slightly produced; length of antennæ about twice the width. Otherwise as in *A. undulatus*.

Yellow or light brown, darker brown over vertex, frons, genæ before eyes, and a band on front tibiæ and femora. Tegmina hyaline with yellowish markings, the basal mark covering base of Cu and clavus except the first claval vein which is white; the subbasal mark is indefinite, sharply bordered on the basal margin by black which projects V-shaped on Cu, but on the apical margin not defined from the yellowish markings which cover apical and subapical cells, the centers of most of these cells being hyaline; a little black mark through apical R cells,

another through Cu fork and a few spots in Cu and last apical M cells; veins same color as membrane; granules minute, obscure. Wings hyaline with yellowish veins.

In lateral view pygofer without anal angle; anal segment large, slightly asymmetrical, the right side being produced slightly more than the left, apex emarginate, anus slightly distad of middle; genital styles in lateral view curved, outer margin concave, inner margin convex, slightly widest at apex which is oblique and subtruncate; periandrium best understood by a study of the figure, penis small, semimembranous, flagellum a little longer than periandrium and in the specimen examined curved round the middle of periandrium.

PENANG (*Baker*), one male.

Andes indistinctus sp. nov. Plate 2, figs. 17 and 18.

Male.—Length, 3.5 millimeters; tegmen, 5.4. R with four apical veins, otherwise as in *A. undulatus*.

Fairly uniformly brown, the extreme edges of the lateral carinæ of frons and vertex fuscous. Tegmina hyaline, very light brown, the subbasal mark represented by two irregular fuscous lines from middle of costa to apex of clavus, a small fuscous mark at base of stigma, apical cells slightly fuscous with an obscure design, veins light brown with a few light spots, granules minute, sparse, same color as veins. Wings light fuscous, veins brown.

Anal angle of pygofer distinct, subangular, ventrad of anal angles sides nearly straight. Anal segment median size, asymmetrical, the apical portion of the right margin produced into a triangular process with acute apex; anus in apical third. Genital styles in lateral view curved, apex slightly widest, subtruncate, outer margin concave, inner margin convex. Periandrium tubular, slightly sinuous, cucullus reaching halfway to base, curved around to left, apex produced into a stout, curved spine; penis small, membranous; flagellum about as long as periandrium.

BORNEO, Mowong (*Muir*), one male, September, 1907.

Andes inaequalis sp. nov. Plate 2, fig. 19.

Male.—Length, 3 millimeters; tegmen, 4.6. Similar in build to *A. undulatus* but R has four branches.

Light brown; tegmina hyaline, slightly fuscous, the subbasal mark represented by two marginal lines running from costa to apical portion of clavus, median mark forming two small, curved

lines between R, M_{1+2}, and M_{3+4}; slightly fuscous over cross veins, through the middle and at apex of apical cells; granules on veins minute, same color as veins. Wings hyaline, slightly fuscous, veins dark.

Lateral margins of pygofer slightly rounded. Anal segment fairly short, asymmetrical, the right margin on apical half being produced into a large angular projection much longer than the width at its base. Genital styles concave on outer margin, convex on inner or subangular about middle, apex broad, subtruncate. The periandrium is produced quadrangularly on basal half of ventral aspect, the dorsal margin rounded from base to middle and from middle to near apex; the cucullus is fairly large, arises from the right side of apical half, and curves to the left; penis membranous, flagellum longer than periandrium.

BORNEO, Sandakan (*Baker*), one male.

In general build and coloration this is very like *A. undulatus*, but the genitalia are distinct.

Andes bakeri sp. nov. Plate 2, fig. 20.

Male.—Length, 2.6 millimeters; tegmen, 4.3. In lateral view junction of frons and vertex angular, slightly produced. Light brown, darker over middle of pronotum and mesonotum, lateral portion of pronotum much lighter, nearly white. Tegmina hyaline, light brown, slightly darker between suture and first claval, nearly white between first and second claval veins. Wings slightly fuscous with slightly darker veins.

Lateral margins of pygofer rounded. Anal segment median size, anus in apical half, apex rounded. Genital styles in lateral view curved, outer margin concave, inner convex or with two slight angles, apex slightly expanded, subtruncate. Periandrium produced into two processes on ventral aspect, the basal one rounded with a minute process, the apical one angular, cucullus fairly large, reaching about one-third from base, curved to left, with the margin produced angularly. Penis small, membranous, flagellum a little longer than periandrium.

SINGAPORE (*Baker*), one male.

Andes cucullatus sp. nov. Plate 2, figs. 21 and 22.

Male.—Length, 4 millimeters; tegmen, 5.7. Stramineous; a small black mark on gena across ocellus, five small black spots on lateral carinæ of frons, and a small black mark at apex of frons. Tegmina hyaline, whitish, veins light stramineous with

minute brownish granules on basal half of tegmina; the subbasal mark represented by five or six small black marks on veins representing the basal margin, and five or six small dark marks on veins representing the apical margin. Wings hyaline, white with waxy secretion, veins stramineous.

The genitalia are remarkable for the great development of the cucullus which is attached to the periandrium from near apex to near base and curves to the left. The details are best understood by the figure.

Female.—Similar to male but the marks on tegmen distinct and slightly fuscous over middle and apical portion of tegmina.

SINGAPORE (*Baker*), one male and one female.

Andes mitellatus sp. nov. Plate 2, figs. 23 and 24.

Male.—Length, 3.7 millimeters; tegmen, 5.3. In build and color this species is similar to *A. cucullatus,* but there are some differences in the genitalia as will be seen from a comparison of the figures. The genital styles in full view are broader in the middle, and in profile longer over the apical portion distad of the angle; the cucullus is not quite so large and does not join the base of the periandrium in the same manner.

The female is darker, the middle of the mesonotum brown; the spots on the veins representing the margins of the subbasal mark are larger, and the apical and subapical cells slightly brownish.

Selangor, Federated Malay States (*Baker*), one male and three females.

Andes insolitus sp. nov. Plate 2, figs. 25 and 26.

Male.—Length, 3.4 millimeters; tegmen, 5. Stramineous; seven or eight small fuscous marks across the lateral carinæ of face, the lateral carinæ of vertex also slightly fuscous, a slight fuscous band at apex of front tibiæ. Tegmina hyaline, the pattern light stramineous, basal mark running from base to near apex of clavus, subbasal mark from middle of costa to apex of clavus, the apical and basal margin thinly margined with fuscous, a slight stramineous mark at apex of costal cell; median mark represented by two small fuscous dots near fork of M_{1+2}; apical cells very slightly fuscous with the normal design very faint; a small fuscous mark at apex of Cu_{1b}; veins same color as membrane or slightly stramineous, granules very minute, fuscous on basal half of tegmina but same color as veins on apical half. Wings hyaline, slightly white with waxy secretion, veins stramineous.

The genitalia are very distinct from those of any other species so far examined, especially the ædeagus. The margins of the anal emargination and the dorsal part of the lateral margins of the pygofer form a slight curve, the ventral portion of the lateral margins is slightly sinuous, and there is a slight angle at the junction of the two. Anal segment short, parallel-sided, apex rounded, anus on apical third. Genital styles large, in lateral view broad at the apex which is subtruncate, oblique, and slightly sinuous. The ædeagus is best understood from the figure; the periandrium is compressed laterally and thin, in lateral view roundly ovate, with the apical and ventral margins curved to the left; the penis is small and the flagellum considerably longer than the periandrium.

The female is similar to the male, only a little darker and the design on tegmen is more distinct.

SINGAPORE (*Baker*), three males and three females.

Andes distinctus sp. nov. Plate 2, fig. 27.

Male.—Length, 3.4 millimeters; tegmen, 5. Stramineous; a few darker marks on lateral carinæ of frons and vertex; mesonotum slightly darker than pronotum. Tegmina hyaline, design stramineous; basal mark running from base to near apex of clavus over Cu and suture, the apical margin bordered with fuscous and a small fuscous spot on Cu; subbasal mark fairly narrow with a V-shaped hyaline spot on costa and broken over Cu fork and M, basal and distal margin thinly bordered with fuscous, a small stramineous mark at apex of costal cell; median mark small, fuscous; apical cells faintly stramineous with the design very faint; veins same color as membrane, granules very small, brown. Wings hyaline, slightly opaque with waxy secretion, veins fuscous.

The genitalia are very distinct, the ædeagus being different from any other species so far examined. The lateral margins of pygofer rounded, no anal angles; anal segment medium size, apex rounded; genital styles in lateral view concave on outer margin, convex on inner, broadest at apex where they are angularly emarginate on outer half. Periandrium large, flattened laterally, thin, hatchet-shaped or subquadrate, longer than broad; on the right side from near base arises a subquadrate or hatchet-shaped process a little more than half the length of the periandrium, with a long, thin process near the base of its ventral edge; the large expanded portion of the periandrium could be considered as a cucullus; across the middle of its inner or right

side there is an angular flange, whose apex is produced into a large acutely angular process which curves over the base of the penis. The penis is small, membranous, the flagellum long and thin.

BORNEO, Sandakan (*Baker*), one male.

Andes bicolor sp. nov.

Female.—Length, 3.6 millimeters; tegmen, 4.4. Dark brown; carinæ of vertex and frons lighter with three or four dark marks, a mark across gena at base of antenna and the posterolateral portions of pronotum lighter. Basal portion of tegmina to near apex of clavus dark brown with two light marks, one along first claval vein and the other on costa near base to Cu f, a small dark mark at apex of costal cell divided from basal mark by a diagonal hyaline mark, the rest of tegmen hyaline with the apical cells slightly fuscous with the typical V-shaped light mark; veins same color as membrane, granules minute, same color as veins. Wings hyaline, white, slightly fuscous over anal area, veins fuscous in fuscous area and at base, light in rest of wing.

BORNEO, Sandakan (*Baker*), one female. This has such a distinct coloration that I do not hesitate to describe the species from a single female.

Andes nexus (Walker).

Cixius nexus WALKER, Proc. Journ. Linn. Soc. London 1 (1857) 148.

This species stands under *Brixia* in the British Museum collection. I have three female specimens from Pontianak, Borneo, which agree with the type and which I consider to be the same.

Brown; darker between carinæ and on sides of clypeus and genæ, carinæ lighter with many small, brown spots; pronotum darker in middle and with some small brown dots on lateral portion; mesonotum dark brown; front femora with a dark band near apex; abdomen dark brown. Tegmina with a distinct design, the basal mark extending from base to near apex of clavus between first claval vein and Cu; subbasal extending from middle of costa, where there is a small, triangular, hyaline patch in middle, to apex of clavus, the margins darker than the rest; median mark forming a small line between R and M_{3+4}; apical cells fuscous with the lighter design fairly distinct; veins same color as membrane, with small brown granules, the cross veins and apical cross veins light against the surrounding fuscous membrane. Wings fuscous with dark veins.

Andes ocellatus sp. nov.

Female.—Length, 4.8 millimeters; tegmen, 6.5. Brown; darker between carinæ of head and the middle of pronotum and mesonotum; front femora with a dark band near apex. Tegmina with a distinct typical design in light brown, the basal mark extending between first claval vein and Cu, and from base to apex of clavus, the subbasal mark on costa extends a little basad of middle to stigma and proceeds to apex of clavus and meets the median mark over Cu; a little apical of the fork there is a distinct dark brown mark with a white central spot; apical cells fuscous with the V-shaped hyaline space distinct; veins same color as membrane with small brown granules.

LUZON, Nueva Vizcaya Province, Imugan (*Baker*), one female. This is such a distinct species on account of the ocellus in the tegmen and the size that I decided to describe it from the single female.

The following species belong to the genus *Andes*:

Andes tortricomorphus (Kirkaldy). Plate 2, fig. 28.

Leirioessa tortricomorpha KIRKALDY, Hawaiian Sugar Planters' Exp. Sta. Ent. Bull. 3 (1907) 112, pl. 8, figs. 19–21.

Andes vitiensis (Kirkaldy).

Leirioessa vitiensis KIRKALDY, Hawaiian Sugar Planters' Exp. Sta. Ent. Bull. 3 (1907) 112.

Andes lamononi (Muir).

Leirioessa lamononi MUIR, Proc. Haw. Ent. Soc. IV 3 (1921) 567.

Andes pulchra (Muir).

Leirioessa pulchra MUIR, Rec. Ind. Mus. 24 (1922) 347.

Andes meander (Walker).

Cixius meander WALKER, List Hom. Ins. 1 (1851) 349.
Brixia meander (Walker) DISTANT, Fauna Brit. Ind., Rhyn. 3 (1906) 270.
Leirioessa meander (Walker) MUIR, Rec. Ind. Mus. 24 (1922) 348.

Andes nubilus (Walker).

Cixius nubilus WALKER, List Hom. Ins. Supp. (1858) 80.
Brixia nubila (Walker) DISTANT, Fauna Brit. Ind., Rhyn. 3 (1906) 270.
Leirioessa nubila (Walker) MUIR, Rec. Ind. Mus. 24 (1922) 348.
Brixia subfasciata STÅL, Berl. Ent. Zeit. 3 (1859) 320.

Andes humeralis (Walker).

Brixia humeralis WALKER, Journ. Linn. Soc. Zool. 10 (1868) 114.

Andes geometrinus (Distant).

Brixia geometrina DISTANT, Ann. & Mag. Nat. Hist. VIII 8 (1911) 746.

Andes inornatus (Distant).

Brixia inornata DISTANT, Ann. & Mag. Nat. Hist. VIII 8 (1911) 745.

This species differs in having four Rs and seven Ms; namely, M_1, a, b, c, 2, 3, 4.

Andes plagosus (Distant).

Brixia plagosa DISTANT, Ann. & Mag. Nat. Hist. VIII 8 (1911) 745.

Andes elongatus (Distant).

Brixia elongata DISTANT, Ann. & Mag. Nat. Hist. VIII 8 (1911) 746.

Andes migratorius (Distant).

Brixia migratoria DISTANT, Ann. & Mag. Nat. Hist. VII 19 (1907) 279.

Andes variolosus (Distant).

Brixia variolosa DISTANT, Ann. & Mag. Nat. Hist. VIII 8 (1911) 746.

This species differs from the typical form in having a short but distinct Sc + R stalk, four Rs and six Ms; namely, M_1, a, b, 2, 3, 4. It comes near to *Brixidia*, and it may be necessary to place it in a new genus.

ILLUSTRATIONS

Plate 1

Fig. 1. *Andes simplex* sp. nov., male genitalia, lateral view.
2. *Andes decoloratus* sp. nov., male genitalia, lateral view.
3. *Andes decoloratus* sp. nov., left genital style, full view.
4. *Andes decoloratus* sp. nov., ædeagus, right side of apex.
5. *Andes trispinosus* sp. nov., male genitalia, lateral view.
6. *Andes trispinosus* sp. nov., ædeagus, right side of apex.
7. *Andes serratus* sp. nov., male genitalia, lateral view.
8. *Andes serratus* sp. nov., ædeagus, right side of apex.
9. *Andes tridentatus* sp. nov., male genitalia, lateral view.
10. *Andes quadrilaminatus* sp. nov., male genitalia, lateral view.
11. *Andes quadrilaminatus* sp. nov., ædeagus, ventral view of apex.
12. *Andes spinosus* sp. nov., male genitalia, lateral view.
13. *Andes fictus* sp. nov., male genitalia, lateral view.
14. *Andes maculifrons* sp. nov., male genitalia, lateral view.
15. *Andes ornatus* sp. nov., male genitalia, lateral view.
16. *Andes ornatus* sp. nov., male genitalia, full view.
17. *Andes ornatus* sp. nov., ædeagus, left side.
18. *Andes ornatus* sp. nov., ædeagus, right side, showing apodeme of penis and ejaculatory duct diagrammatically.
19. *Andes pulchellus* sp. nov., male genitalia, lateral view.
20. *Andes brunneus* sp. nov., male genitalia, lateral view.

Plate 2

Fig. 1. *Andes furcatus* sp. nov., male genitalia, lateral view.
2. *Andes parvus* sp. nov., male genitalia, lateral view.
3. *Andes stramineus* sp. nov., male genitalia, lateral view.
4. *Andes unifasciatus* sp. nov., male genitalia, lateral view.
5. *Andes dubiosus* sp. nov., ædeagus, ventral view.
6. *Andes dubiosus* sp. nov., male genitalia, lateral view.
7. *Andes pseudobrunneus* sp. nov., male genitalia, lateral view.
8. *Andes brunniceps* sp. nov., male genitalia, lateral view.
9. *Andes undulatus* Stål, male genitalia, lateral view.
10. *Andes marmoratus* (Uhler), male genitalia, lateral view.
11. *Andes marmoratus* (Uhler), apex of ædeagus with cucullus curved to left.
12. *Andes usitatus* sp. nov., male genitalia, lateral view.
13. *Andes serrulatus* sp. nov., male genitalia, lateral view.
14. *Andes mindanaensis* sp. nov., male genitalia, lateral view.
15. *Andes angulatus* sp. nov., base of genital styles.
16. *Andes angulatus* sp. nov., male genitalia, lateral view.
17. *Andes indistinctus* sp. nov., male genitalia, lateral view.
18. *Andes indistinctus* sp. nov., right genital style.

19. *Andes inaequalis* sp. nov., male genitalia, lateral view.
20. *Andes bakeri* sp. nov., male genitalia, lateral view.
21. *Andes cucullatus* sp. nov., male genitalia, lateral view.
22. *Andes cucullatus* sp. nov., male genitalia, full view.
23. *Andes mitellatus* sp. nov., right genital style, full view.
24. *Andes mitellatus* sp. nov., male genitalia, lateral view.
25. *Andes insolitus* sp. nov., male genitalia with ædeagus dissected out, lateral view.
26. *Andes insolitus* sp. nov., ædeagus, right side view.
27. *Andes distinctus* sp. nov., male genitalia, lateral view.
28. *Andes tortricomorphus* (Kirkaldy), left tegmen; *bm*, basal mark; *sbm*, subbasal mark; *sam*, subapical or median mark; *am*, apical mark; *C*, costa; *Sc*, subcosta; *R*, radius; *Cu*, cubitus; *Cl*, claval veins.

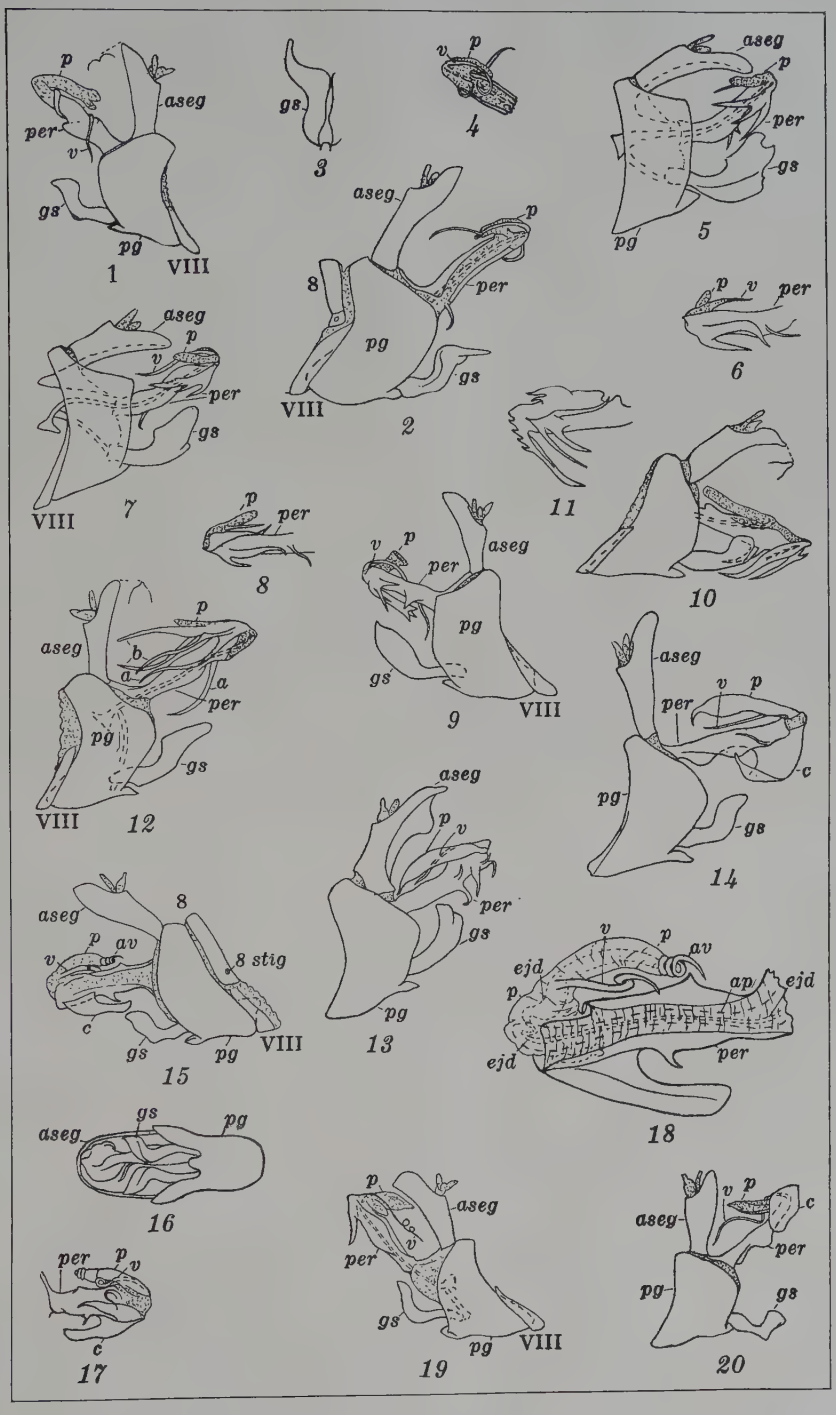

p
aseg
per
v
gs
pg
1
VIII
gs
3
v
p
4
aseg
p
per
gs
pg
5
aseg
p
per
gs
8
pg
VIII
2
p
v
per
6
aseg
p
v
per
gs
VIII
7
11
10
p
per
8
v
p
per
aseg
pg
gs
9
VIII
p
aseg
b
a
a
per
pg
gs
VIII
12
aseg
v
p
per
c
pg
gs
14
aseg
p
v
per
8
av
8 stig
c
gs
pg
VIII
15
aseg
p
v
per
gs
pg
13
v
p
av
ejd
p
ap
ejd
ejd
per
18
gs
aseg
pg
16
per
p
v
c
17
p
aseg
v
per
gs
pg
VIII
19
v
p
c
aseg
per
pg
gs
20

PLATE 1.

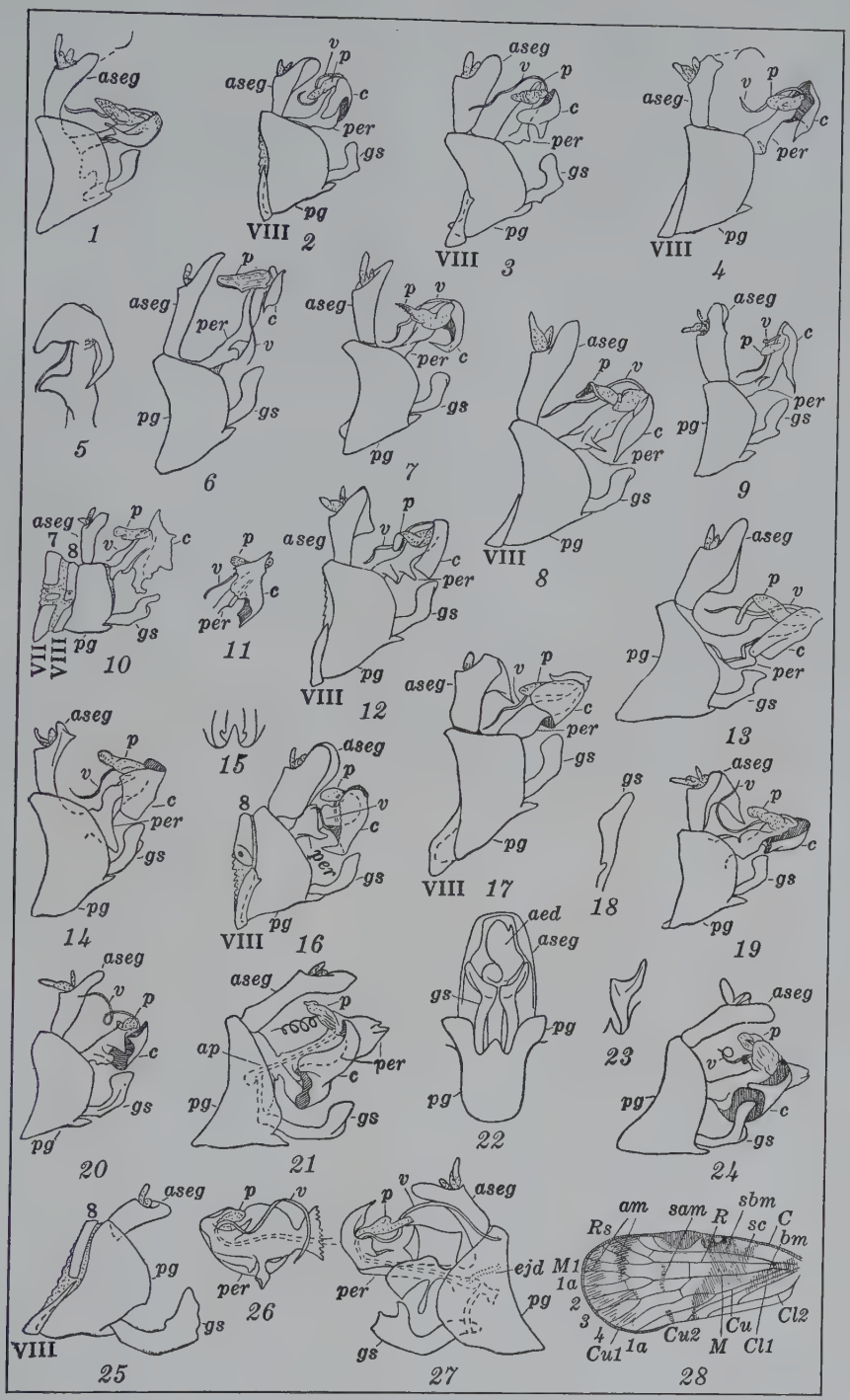

aseg
p
v
c
per
gs
pg
VIII
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
ap
aed
ejd
am
sam
sbm
Rs
R
sc
C
bm
M1
1a
2
3
4
Cu1
Cu2
Cu
M
Cl1
Cl2

PLATE 2.

HELMINTH PARASITES OF HOGS IN THE PHILIPPINE ISLANDS

By BENJAMIN SCHWARTZ

Of the Bureau of Animal Industry, Department of Agriculture, Washington

TWO PLATES

This report lists the helminth parasites collected by me from hogs slaughtered in the Azcarraga abattoir in Manila; hogs that succumbed to disease and were autopsied in the clinic of the College of Veterinary Science of the University of the Philippines at Los Baños, Laguna Province, Luzon; and hogs killed for food in the vicinity of Los Baños. One species of parasite is listed from a hog from Pampanga Province, Luzon.

Prior to my investigations of parasites of domestic animals in the Philippine Islands, begun in January, 1921, and continued until the spring of 1923, only two species of helminths from swine had been actually recorded from the Philippines, although the occurrence of two additional species appears to have been generally known or suspected. The published records are those of Boynton (1914), who records the kidney worm of swine (*Stephanurus dentatus* Diesing, 1839) as occurring in native as well as in imported swine, and *Metastrongylus* species as occurring in swine presumably imported from foreign countries. The apparently known though not definitely recorded species are *Cysticercus cellulosæ* (Gmelin, 1790), reported by Schwartz and Tubangui (1922) on the basis of data obtained from the Bureau of Agriculture, through the courtesy of Dr. Stanton Youngberg; and the common intestinal roundworm of hogs, *Ascaris lumbricoides* Linnæus, reported from Philippine hogs by me in 1922. In addition to the above-mentioned species, the occurrence of *Cysticercus tenuicollis* (Rudolphi, 1810), the larval stage of *Tænia hydatigena* Pallas, 1776 was reported by me in 1922. Six of the eleven species listed in this paper are recorded for the first time from the Philippine Islands.

TREMATODA

No trematodes have been found in swine in Los Baños and Manila, by me or by my former students.

CESTODA

Tænia solium Linnæus.

Cysticercus cellulosæ, the larval stage of *Tænia solium*, is a common parasite of Philippine hogs and is of considerable economic and hygienic importance. It occurs in about 1.5 per cent of the hogs slaughtered in Manila. Specimens were collected in Manila and Los Baños. Reported by Schwartz and Tubangui (1922) and by Schwartz (1922).

Tænia hydatigena Pallas.

Cysticercus tenuicollis is the larval stage of a dog tapeworm, *Tænia hydatigena*, a parasite that has not yet been recorded from Philippine dogs. Reported by me (1922) from the abdominal cavity of a hog from Pampanga Province.

NEMATODA

Ascaris lumbricoides Linnæus, 1758.

Ascaris lumbricoides is not very common in hogs slaughtered for food in Manila. Records on the incidence of this parasite in hogs in Los Baños were published by me in 1922. I encountered a few cases of heavy infestations with this parasite among young pigs, and in several instances the larval stages of *Ascaris* were found in the lungs of pigs autopsied in the clinic of the College of Veterinary Science.

Hyostrongylus rubidus (Hassall and Stiles, 1892).

These are very slender reddish nematodes, located on the mucosa of the stomach. The parasites are either straight or coiled in their normal location. The males are about 5 millimeters in length, and the females range from 8 to 8.5. The maximum width of these worms is only a little over 0.1 millimeter.

These worms are frequently associated with a catarrhal inflammation of the mucosa of the stomach, and sometimes with an extensive ulceration of the stomach wall. The parasites have been encountered, however, in normal stomachs, and pathological conditions of the stomach mucosa such as may be associated with the worms may occur in the absence of the parasites.

These parasites were commonly encountered in the stomach of hogs autopsied in Los Baños.

Œsophagostomum dentatum (Rudolphi, 1803).

These are small whitish worms, from 8 to 15 millimeters long, the maximum size being attained by the females only. The

larval stages of the parasite occur in nodules in the wall of the large intestine and cæcum, in the lumen of which organs the adults can be found. The parasites are of very common occurrence in the Philippines. Practically all hogs autopsied in Los Baños contained both larval and adult parasites, although the latter were not quite so common as the former. This species was also found to be abundant in hogs slaughtered in Manila.

Stephanurus dentatus Diesing, 1839.

This is the well-known kidney worm of swine, and was first reported from the Philippines by Boynton in 1913. The parasites are found, not only in the kidney and the fat surrounding the kidney, but also in the liver, lungs, pleural cavity, lumbar muscles, spleen, and spinal cord.

Boynton (1914) states that of 2,000 hogs examined in a Manila abattoir nearly 50 per cent were infested with this parasite. These hogs had been reared in Luzon and came from Batangas, Bulacan, Cavite, Rizal, Zambales, Tarlac, Pampanga, and Nueva Ecija Provinces and from Manila.

I have found this parasite to be quite common in hogs in Los Baños and in hogs slaughtered in Manila. According to information given to me by the meat inspector of the Azcarraga abattoir in Manila, native hogs are less likely to be heavily infested with *Stephanurus dentatus* than imported hogs.

Metastrongylus elongatus (Dujardin, 1845).[1]

This is the only species of lungworm in hogs that I found in the Philippines. The parasites are slender and whitish; the males attain a length of about 2.5 centimeters, and the females, about 5. These parasites occur in the trachea, bronchi, and bronchioles. In cases of heavy infestation they may produce bronchitis. *Metastrongylus elongatus* was frequently encountered in hogs slaughtered in Los Baños, and heavy infestations were by no means uncommon. *Metastrongylus* species is recorded by Boynton (1914) from Manila.

Arduenna strongylina (Rudolphi, 1819).

This parasite is commonly associated with *Hyostrongylus rubidus* on the mucosa of the stomach, and may be readily dis-

[1] Since this paper was written a new species of lungworm from swine has been described by Gedoelst (1923) under the name *Metastrongylus salmi*. An examination of specimens from a bottle containing lungworms from Philippine swine showed that *Metastrongylus salmi* Gedoelst, 1923, has been collected in the Philippine Islands.

tinguished from the latter species by its larger size. The males are from 10 to 15 millimeters long and the females may attain a length of 20 millimeters. The maximum width is about 0.4 millimeter.

Stomach lesions similar to those described in connection with *Hyostrongylus rubidus* appear to be associated with this parasite, which is of common occurrence in hogs in Los Baños and Manila.

Gnathostoma hispidum Fedtchenko, 1872.

This is a relatively large stomach worm with a distinct head bulb containing 9 to 11 rows of hooks. The entire body is covered with spines.

A single specimen was collected by my former assistant, from a hog slaughtered in Los Baños college. The worm was put in a bottle containing miscellaneous hog parasites, and nothing was given as to the location of the worm or of possible lesions associated with it.

This parasite is known to occur in the stomach of swine in certain parts of the world. It may lie free in the lumen but is usually firmly embedded in the stomach wall, the head and a portion of the body being inserted to a depth of about 5 millimeters. The worm is probably a bloodsucker.

Trichuris suis (Schrank, 1788).

This is the whipworm of swine and is of common occurrence in the cæcum of Philippine hogs. Specimens were collected in Manila and in Los Baños.

Over one hundred samples of muscle tissue from the diaphragms of as many hogs were examined microscopically for trichinæ, with negative results. I also failed to detect trichinæ in about twenty samples of muscle tissue from rats. Trichinosis in man has not been recorded in the Philippines.

ACANTHOCEPHALA

Macracanthorhynchus hirudinaceus Pallas, 1781.

I have a single specimen of this species, collected from the intestine of a wild hog trapped on the college grounds at Los Baños. I have never encountered this parasite in domestic hogs autopsied in Los Baños and have not seen it in the Azcarraga abattoir in Manila.

The species enumerated above represent but a small fraction of the helminth parasites known to occur in swine in various parts of the world. It is very probable that species not recorded

in this paper occur in the Philippines, and it is hoped that the publication of this preliminary list of parasites from Philippine swine will stimulate other workers in the Philippines to study the helminth fauna of these highly important food animals.

In Table 1 the parasites listed in this paper are arranged in accordance with their location in various organs as observed by me in the course of post-mortem examinations of swine.

TABLE 1.—*Helminth parasites and the organs in swine in which they were found.*

Species recorded.	Organ.	Frequency of occurrence.
Hyostrongylus rubidus	Stomach	Very common.
Arduenna strongylina	do	Do.
Gnathostoma hispidum	do	Rare.
Ascaris lumbricoides	Small intestine	Common.
Macracanthorhynchus hirudinaceus	do	Rare.
Œsophagostomum dentatum	Large intestine	Very common.
Do	Cæcum	Do.
Trichuris suis	do	Common.
Metastrongylus elongatus	Lungs	Do.
Ascaris lumbricoides larvæ	do	Not definitely known; apparently common.
Stephanurus dentatus	do	Rare.
Do	Kidney [a] and fat surrounding kidney.	Very common.
Cysticercus cellulosæ	Muscles [b]	Do.
Cysticercus tenuicollis	Abdominal cavity	Not known; apparently rare.

[a] This parasite also occurs in other organs, as noted elsewhere in this paper.

[b] Principally in the tongue, muscles of mastication, muscles of shoulder, neck, and diaphragm.

REFERENCES TO LITERATURE CITED

BOYNTON, WILLIAM HUTCHINS. Kidney-worm infestation of swine in the Philippine Islands. Philip. Agr. Rev. 6 (1913) 395–398.

BOYNTON, WILLIAM HUTCHINS. Kidney-worm infestation of swine in the Philippine Islands with special reference to the pathological changes. Philip. Journ. Sci. § B 9 (1914) 269–289.

SCHWARTZ, BENJAMIN. Ascarid infestation of domestic animals in the Philippine Islands. Philip. Agr. Rev. 15 (1922) 246–251.

SCHWARTZ, BENJAMIN. Some cestodes from domestic animals in the Philippine Islands that are of economic and hygienic importance. Philip. Agriculturist 11 (1922) 113–116.

SCHWARTZ, BENJAMIN, and MARCOS A. TUBANGUI. Uncommon intestinal parasites of man in the Philippine Islands. Philip. Journ. Sci. 20 (1922) 611–618.

ILLUSTRATIONS

PLATE 1. ŒSOPHAGOSTOMUM DENTATUM (RUDOLPHI)

FIG. 1. Male and female, enlarged; *x*, position of vulva. Original drawing.

2. Anterior end greatly enlarged; *cg*, cervical groove; *int*, intestine; *lp*, lateral papilla; *oes*, œsophagus. Original drawing.

3. Posterior end of female, greatly enlarged; *an*, anus; *e*, egg; *int*, intestine; *ovij*, ovijector; *ut*, uterus; *vul*, vulva. Original drawing.

4. Posterior end of male, greatly enlarged; *d*, dorsal ray; *ed*, externo-dorsal ray; *el*, externo-lateral ray; *gub*, gubernaculum; *lv*, latero-ventral ray; *ml*, medio-lateral ray; *pl*, postero-lateral ray; *sp*, spicule; *td*, terminal branch of dorsal ray; *vv*, ventro-ventral ray. Original drawing.

5. Bursa of male, side view, greatly enlarged; designations of letters the same as in fig. 4. Original drawing.

PLATE 2

FIG. 1. *Hyostrongylus rubidus* (Hassall and Stiles), caudal portion of male. From Hassall and Stiles (1892) fig. 1.

2. *Stephanurus dentatus* Diesing, female. From Tayler (1900) fig. 31.

3. *Stephanurus dentatus* Diesing, bursa of male with spicules. From Tayler (1900) fig. 35.

4. *Metastrongylus elongatus* (Dujardin), male and female, × 5. From Neeu-Lemaire (1918).

5. *Arduenna strongylina* (Rudolphi); *an*, anus; *ut*, uterus; *v*, vagina, × 7. From Foster (1912) figs. 10 and 11.

6. *Arduenna strongylina* (Rudolphi); anterior portion of worm, × 500. From Foster (1912) fig. 1.

7. *Arduenna strongylina* (Rudolphi), male; posterior end of body, × 65. From Foster (1912) fig. 3.

8. *Arduenna strongylina* (Rudolphi), female; posterior end of body, × 150. From Foster (1912) fig. 4.

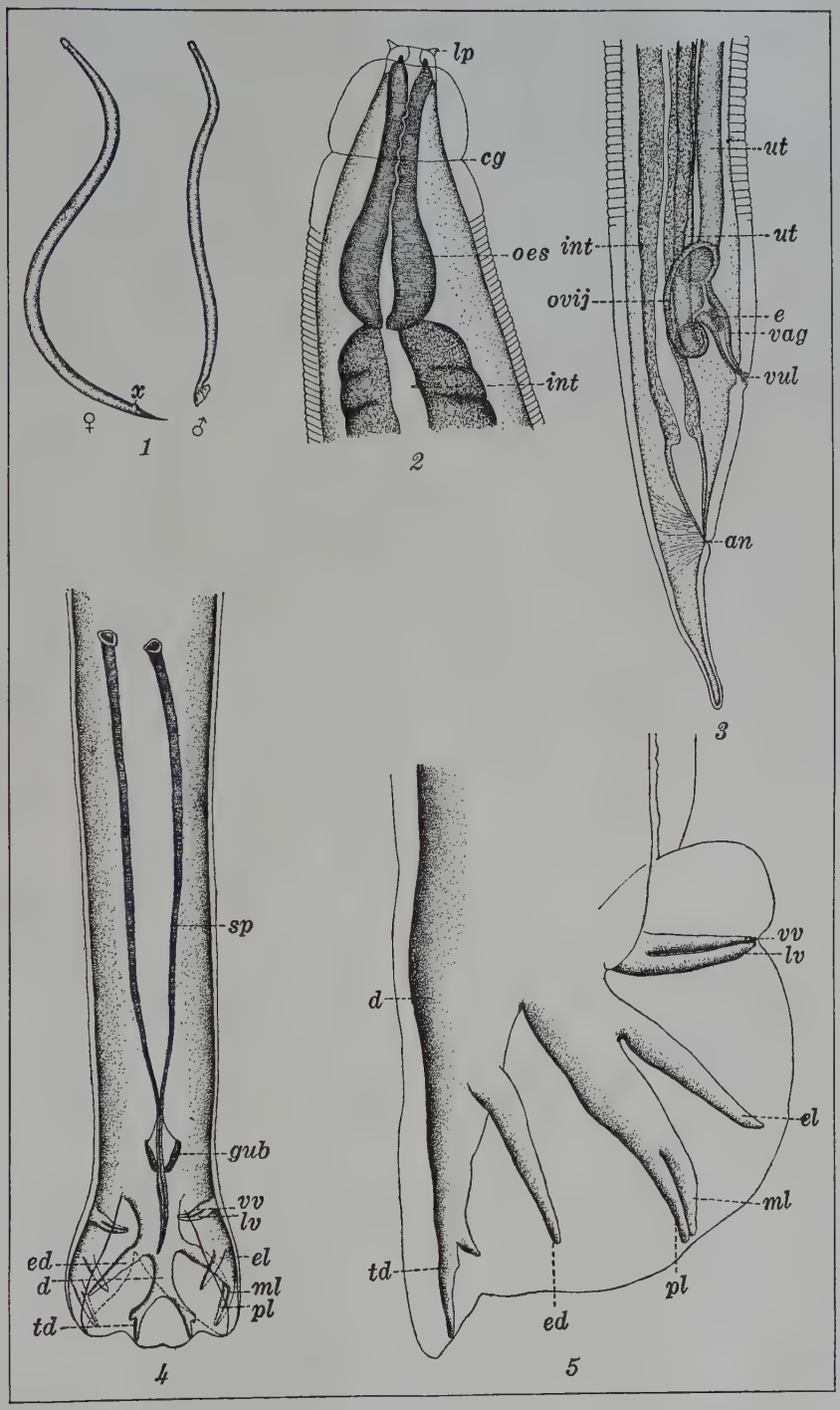


PLATE 1. ŒSOPHAGOSTOMUM DENTATUM (RUDOLPHI).

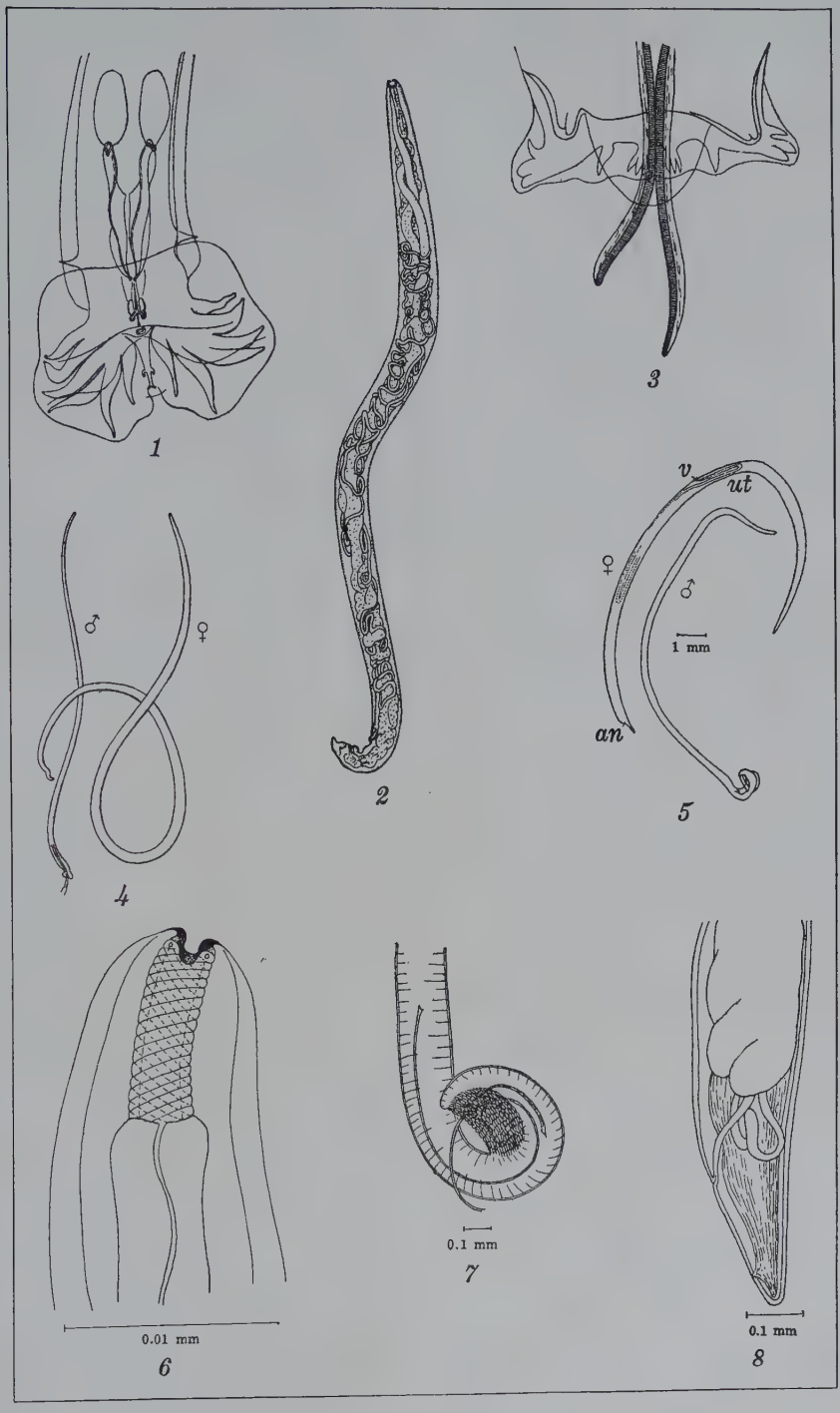


PLATE 2. HELMINTHS FROM HOGS.

MACROXENOS PIERCEI (ORDER STREPSIPTERA), A NEW GENUS AND SPECIES OF WASP PARASITES OF THE PHILIPPINE ISLANDS

By W. SCHULTZE

Entomologist, Bureau of Science, Manila

ONE PLATE

Some time ago Mr. C. S. Banks, former entomologist of the Bureau of Science, called my attention to the fact that a certain species of Rhipiphoridæ seemed to be a rather common parasite on one of the commoner solitary wasps found around Manila, *Rhynchium atrum* Saussure (Eumenidæ). Since the Coleoptera of the family Rhipiphoridæ [1] seem to be rare and are very little known as far as the Philippines are concerned, I deemed it advisable to investigate this matter. Very unexpectedly, instead of finding the parasite of the last-mentioned family, a new species of a new genus was discovered, belonging to the order Strepsiptera, an order of insects very little known in the Philippines. Up to the present, to my knowledge, only two species of Strepsiptera are known from these Islands; namely, *Halictoxenos manilae* Pierce [2] and *H. robbii* Pierce. Unfortunately, both species are known and described from female specimens only. The hosts of these, *Halictus* (*Evylaeus*) *manilae* and *H. robbii* Ashmead, belong to the family Apidæ.

The first-mentioned eumenid wasp is at times abundant around Manila and is considered a nuisance in and around houses, since it is very alert in finding and appropriating holes in furniture, key holes, and other suitable holes or crevices for building its nest, and it plugs up such places with mud, thus causing much annoyance. As a matter of fact, the wasp is really beneficial and of considerable economic importance, since it destroys only caterpillars, as food for its young. As many as eleven caterpillars have been found paralyzed in one of its cells. The caterpillars mostly belong to a species of Pyralidæ, injurious to

[1] The species *Rhipidius scutellaris* Heller I discovered to be parasitic on Blattidæ.

[2] Bull. U. S. Nat. Mus. 66 (1909) 151; Proc. U. S. Nat. Mus. 54 (1919) 459.

ornamental and other plants. Knowing the peculiar habit of *Rhynchium atrum* and the manner in which it readily utilizes almost any kind of hole or tube for building its nest, I constructed a series of artificial nesting devices, particularly with the idea in view of obtaining larger numbers of wasp nests for observation, and thus increasing the chances of obtaining parasites. The artificial nesting places provided consisted of 5-centimeter lengths of bamboo, with an outer diameter of from 10 to 11 millimeters and the diameter of the hole from 6 to 9 millimeters. The tubes were placed upright, at suitable intervals, in soft plaster of Paris after the latter had been cast on the inside of the cover of a cylindrical tin can (Plate 1, fig. 6). These disks were so attached to a wall or other suitable location as to place the tubes in a horizontal position. The advantage of using tubes is that any tube after being occupied by a wasp as a nesting place (usually two cells are located in one tube) can be removed from the disk and split open; after the contents have been examined the tube can be tied with fine wire and put back in the disk for further developments and observation. After all the tubes in a disk were filled with nests they were placed in a large glass jar so as to prevent the escape of the emerging wasps.

A few days after the commencement of my experiments, I was successful in having ten tubes occupied by cells of these wasps on September 19 and 20, 1924, each tube containing two cells. The first four (three males and one female) adult specimens of wasps from two tubes emerged on October 13, 1924, twenty-six days after the cells had been finished by the mother wasp. I noticed that in two of the male wasps, hereafter called wasp 1 and wasp 2, the abdomen was slightly distorted and, upon careful examination, found them to be stylopized by pupæ of Strepsiptera.

Wasp 1 had four parasites (two male and two female pupæ), the female pupæ protruding dorsally between the third and fourth segments and the male pupæ protruding between the fourth and fifth segments (Plate 1, fig. 5). The male parasites emerged October 20, 1924, seven days after the wasp emerged from its cell. The female parasites were dissected from the wasp after the death of the latter, which occurred on November 1, 1924.

Wasp 2 had one parasitic male pupa protruding dorsolaterally between the fourth and fifth segments (Plate 1, fig. 4). Up to the death of the wasp this male parasite did not emerge from

the pupa. From the same series of tubes, between October 14 and 24, six wasps (four males and two females) emerged, none of them stylopized. Between October 15 and 24, five wasps emerged, not stylopized. Between October 16 and 24, three wasps emerged, two of which were stylopized, hereafter called wasp 3 and wasp 4.

Wasp 3 had one male pupa protruding dorsally between the fourth and fifth segments; the parasite emerged on October 22, 1924, and the wasp died on November 20, 1924.

Wasp 4 had one female parasite protruding dorsally between the third and fourth segments; the wasp died on November 17, 1924.

From the original disk with ten tubes altogether eighteen wasps emerged, the last on October 16, 1924, so that in this experiment the development of the wasps, from the time of closing the cells to the appearance of the young adults, took from twenty-six to twenty-nine days. I suspect that all these wasps were the offspring of the same mother wasp. I made a rather peculiar observation concerning the habit of this species of wasp between October 19 and 24. An old female, which had the wings slightly torn, closed four of the artificial bamboo nesting tubes in about thirty minutes. Since thirty minutes appeared to me entirely too short a time for the wasp to secure enough caterpillars for eight cells, to lay the eggs, and to close all the cells, I opened the tubes and found all of them to be empty. Several days later another wasp closed twenty tubes in about three hours, and upon examination these also were found to be empty. As to the actual time that it takes for this species of wasp to finish its cells, I have made only one observation. In this case a wasp closed three tubes, each containing two cells and each cell containing from six to nine caterpillars, in four and one-half hours, after which time darkness set in and the wasp disappeared. It appeared as if the mother wasp did not have difficulty in obtaining caterpillars, since it returned at very short intervals with its food supply for the nest. All the caterpillars were of the same species.

Another peculiar observation was made concerning the habits of *Rhynchium atrum* Saussure, in Manila. From the last week of October until the last week of November, 1924, about six hundred tubes as described above were placed in five favorable localities in Manila. Until now (December 5) only six tubes have been found occupied by cells, which seems to indicate that certain seasons of the year are extremely unfavorable for the

breeding of this wasp, probably because of the scarcity of food supply for the offspring. Further observations in this respect are necessary to clear up this point.

The descriptions of the parasites taken from *Rhynchium atrum* Saussure in this experiment follow.

XENIDÆ (STREPSIPTERA)

XENINÆ

Genus **MACROXENOS** novum

Male.—Antenna four-jointed, second joint shortest, cup-shaped, third and fourth joints very elongate, laterally depressed, sublamelliform, fourth joint arising from base of third and nearly equal in length to the latter, both joints forming an irregular fork. Wings with seven veins, five arising from base, radius and premedia abbreviated.

Female.—Xenid; cephalothorax similar in general form to that of *Acroschismus* Pierce.

Parasitic on Eumenidæ:

Type species, *Macroxenos piercei* sp. nov., from the Philippine Islands.

Macroxenos piercei sp. nov. Plate 1, figs. 1 and 2.

Male.—Head, prothorax, mesothorax, and metathorax glossy dark castaneous brown, abdomen lighter grayish brown. Antennæ with the third and fourth sublamelliform joints minutely but very regularly flattish disklike subgranulate. Eyes black; palpi two-jointed; legs yellowish, with four tarsal joints, the latter slightly fuscous. Foreleg with the tarsal joints slightly shorter than the tibia; middle leg with the tarsal joints about equal in length to tibia; hind leg with the tibia much shorter than the combined length of the tarsal joints. Wings with the costal margin thickened to the middle; subcosta also thickened toward middle, then abruptly terminating as a distinct vein, but continued as a fine demarcation line of a cloudy area inclosed by the costa and the latter; radius thickened, abbreviated, extending from apical angle to near middle; premedia also abbreviated, extending from outer margin to beyond middle; media continuous; cubitus absent; three anal veins. The wings in life have a milky or opalescent white appearance, the veins brown. Length from front to anal segment, 3.82 millimeters; wings, from base to apex, 2.2; length of male puparium, 3.82. The three male specimens before me show no perceptible variations in their characters.

Female.—Cephalothorax and head amber colored, lateral margins and demarcation lines brownish.

Measurements [3] of the type specimen are: Width at spiracles, 1.35 millimeters; width of base of head, 1.11; width of head at emargination near base of mandibles, 0.46; width of cephalothorax at base, 1; length from front edge of spiracle to apex of head, 1.11; length from base to apex of cephalothorax, 1.72.

Measurements of the female cotype specimen are: Width at spiracles, 1.32 millimeters; width of base of head, 1; width of head at emargination near base of mandibles, 0.45; width of cephalothorax at base, 1.11; length from front edge of spiracles to apex of head, 1.05; length from base to apex of cephalothorax, 1.65.

Host.—*Rhynchium atrum* Saussure (Eumenidæ), Manila, P. I., October and November, 1924 (*Schultze*).

I name this species in honor of Mr. W. Dwight Pierce, who has done much good work on the order Strepsiptera.

The two females and two males here discussed came from wasp 1 and were attached to its abdomen, as indicated in Plate 1, fig. 5. The male puparium came from wasp 2, protruding from its abdomen, as shown in Plate 1, fig. 4.

The female that I obtained from wasp 4 shows rather strong differences in the general form of the cephalothorax as well as in the demarcation lines, so much so that I am still in doubt whether to consider it as a variation of the above-described species or as still another new species. Since it was found parasitic on the same species of wasp, I feel inclined at present to leave this question pending until more material can be obtained. This specimen is shown on Plate 1, fig. 3. Its measurements are: Width at spiracles, 1.57 millimeters; width of base of head, 1.23; width of head at emargination near base of mandibles, 0.51; width of cephalothorax at base, 1.05; length from front edge of spiracle to apex of head, 1.09; length from base to apex of cephalothorax, 1.77.

The abdomen of this as well as of the two other female specimens is almost entirely filled with subovoid or subglobular bodies, which have the appearance of undeveloped ova.

[3] In taking these measurements I followed exactly the system indicated by Pierce, Proc. U. S. Nat. Mus. 54 (1919) 406, text fig. 5.

ILLUSTRATION

[Drawings by W. Schultze.]

PLATE 1

FIG. 1. *Macroxenos piercei* sp. nov., male.
2. *Macroxenos piercei* sp. nov., cephalothorax of female.
3. *Macroxenos* sp., female.
4. *Rhynchium atrum* Saussure, abdomen of wasp with attached male puparium of *Macroxenos piercei* sp. nov.
5. Abdomen of wasp with two female pupæ and two empty male puparia attached.
6. Artificial nesting tubes.

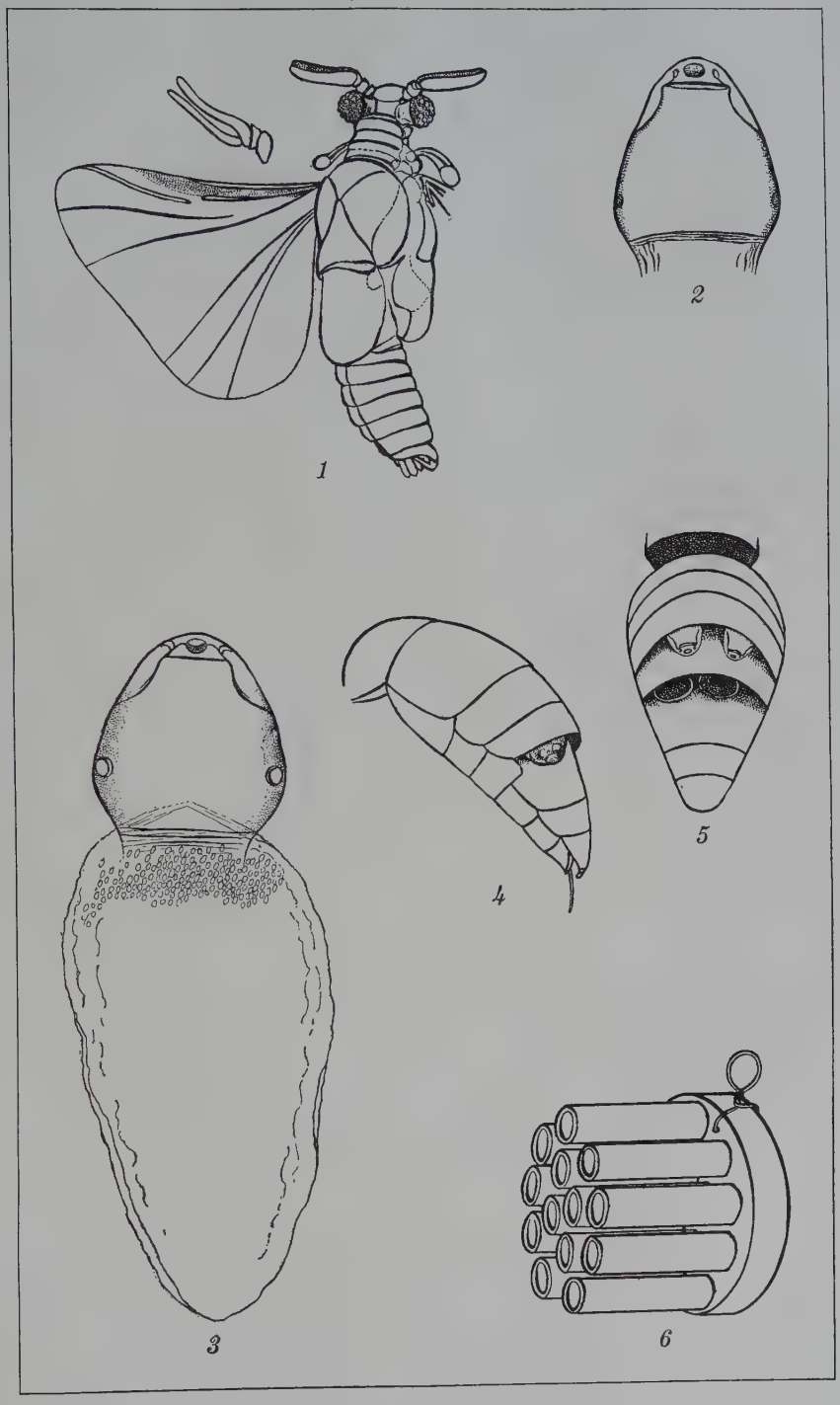


PLATE 1.

THE COMPARATIVE RESISTANCE TO FOOT ROT OF VARIOUS CITRUS SPECIES AS ROOT STOCKS

By H. Atherton Lee

Formerly Mycologist, Bureau of Science, Manila

ONE PLATE AND ONE TEXT FIGURE

Foot rot is a disease of *Citrus* trees very common in countries of commercial citrus production. In the United States descriptions of the disease have been published by Galloway,(3) by Swingle and Webber,(8) and by Stevens;(7) it occurs in both Florida and California. Galloway(3) in 1889 described the disease as of long duration in southern Europe at that time, and quoted references showing that it occurred in the Azores as early as 1840. Fawcett(1) reports the disease from Cuba.

Foot rot has been observed by me in Japan, upon trees for which *Poncirus* (*Citrus*) *trifoliata* has been used as the stock. The disease is not uncommon in Japan. Foot rot is very common and widespread in South China, especially upon the seedling sweet orange trees, and is rather destructive; together with bark rot and California scaly bark, it causes the wiping out of entire orchards. In the mountain districts of Java also, where seedling sweet oranges are grown, foot rot is not uncommon and it causes very severe losses.

In the Philippines foot rot has not been previously reported, although it is rather commonly found wherever seedling sweet oranges are grown or where sweet orange stock is used for *Citrus* species. In such plantings as the *Citrus* collection at the Lamao Horticultural Station, the disease is very destructive, causing death of mature trees when no control methods are attempted.

It has been possible at the Lamao Horticultural Station, in Lamao, Bataan Province, Luzon, to obtain some comparative data of the susceptibility or resistance of several of the *Citrus* species to foot rot. There are two orchards at that station consisting of collections of commercial citrus varieties from various countries and for these varieties different stocks have

been used upon which to bud the introduced varieties. Very fortunately, carefully prepared labels were attached to the trees, showing not only the budded variety, but the stock employed.

Foot rot first became evident in the orchards at Lamao in 1918, and by 1920 was very prevalent in the older of the two orchards of introduced varieties. With constant association with the orchard a correlation gradually became evident between the occurrence of the disease and the character of the stocks employed. To corroborate the impression of this correlation a count was made of the occurrence of the disease and the stocks of the trees upon which it occurred. The record of this count is presented here.

Before recording and discussing this comparative susceptibility, since foot rot is a new disease to most of the horticulturists of the Philippines, a short description may be of some assistance.

DESCRIPTION OF FOOT ROT

The first indication of the occurrence of the disease is the formation of drops of gum exuding through the bark of the tree, usually just above the surface of the soil, rarely more than 35 to 50 centimeters above the surface. If the lesion is older the bark will appear to be depressed and cracking slightly. In more-advanced lesions the healthy tissues of the bark attempt to heal over the dead cracked bark and sometimes succeed for a time, forming a very definite line of demarcation around the lesion. The lesions are frequently just as widely extended laterally as longitudinally and often run down on the large roots near the surface connecting with the trunk and in some cases entirely girdle such roots. By cutting into one of the lesions it is found that the bark is dead, masses of gum are uncovered under the dead bark, and the wood beneath is discolored.

Affected trees may not show the effects in the foliage for a year or two; but, as the lesions at the base of the trunk spread and girdling becomes more complete, the foliage yellows and gradually becomes thinner, and the leaves drop until the tree is barren and lifeless.

The lesions of the disease are shown much more clearly in the photographs reproduced in Plate 1 than is possible from a written description.

Fawcett(2) isolated a fungus from foot rot lesions, which upon inoculation in healthy trees produced typical foot rot. This pathogenic fungus was subsequently described by Sherbakoff(6) as *Phytophthora terrestria.*

COMPARATIVE SUSCEPTIBILITY OF ROOT STOCKS

Figure 1 and Table 1 show the layout of the two orchards of citrus collections and the occurrence of foot rot. The data shown in fig. 1 have been summarized and are presented in Table 2.

TABLE 1.—*Showing the occurrence of the various citrus stocks.*

[SO, sweet orange; CE, *Citrus excelsa;* Cal, calamondin; P, pummelo; Sour, sour orange. Under each row are given for each tree the tree number, the budded variety, the stock, and remarks.]

Orchard A:

Row 1—
- Tree 1. Valencia O; SO; foot rot.
- Tree 2. Valencia O; SO.
- Tree 3. Tizon mandarin O; SO.
- Tree 4. Tizon mandarin O; SO.
- Tree 5. Tizon mandarin O; CE.

Row 2—
- Tree 1. Valencia O; Cal; poor bud union.
- Tree 2. Valencia O; Cal; poor bud union.
- Tree 3. Ladu mandarin O; P.
- Tree 4. Dead.
- Tree 5. Igorot orange; unknown.

Row 3—
- Tree 1. Out.
- Tree 2. Out.
- Tree 3. Native lime; SO.
- Tree 4. Native lime; SO; foot rot.
- Tree 5. Calpi; SO; foot rot.
- Tree 6. Calpi; CE.
- Tree 7. Tangelo; Cal; poor growing condition.
- Tree 8. Out.
- Tree 9. Lemon variety; SO; foot rot.

Row 4—
- Tree 1. Native pummelo; SO.
- Tree 2. Native pummelo; SO.
- Tree 3. Out.
- Tree 4. Native pummelo; SO.
- Tree 5. Calpi; SO; foot rot.
- Tree 6. Calpi; SO.
- Tree 7. Native pummelo; SO; foot rot.
- Tree 8. West Indian lime; SO; foot rot.
- Tree 9. West Indian lime; SO.
- Tree 10. West Indian lime; SO.

Row 5—
- Tree 1. Murrill orange (lime); SO; foot rot.
- Tree 2. Murrill orange (lime); SO; foot rot.
- Tree 3. Native sweet orange; SO.
- Tree 4. Native sweet orange; SO; foot rot.
- Tree 5. Ellen grapefruit; SO; foot rot.
- Tree 6. Ellen grapefruit; SO; foot rot.

TABLE 1.—*Showing the occurrence of the various citrus stocks*—Ctd.

Orchard A—Continued.

Row 6—

Tree 1. Pernambuco grapefruit; unknown.
2. Pernambuco grapefruit; unknown.
3. Oneco mandarin orange; Cal; good bud unions between Calamondin and Oneco mandarin orange.
4. Oneco mandarin orange; Cal; good bud unions between Calamondin and Oneco mandarin orange.

Row 7—

Tree 1. Oneco mandarin orange; SO.
2. Oneco mandarin orange; SO.

Row 8—

Tree 1. Sampson tangelo; SO; foot rot.
2. Sampson tangelo; SO; foot rot.
3. Marsh grapefruit; SO; foot rot.
4. Marsh grapefruit; SO; foot rot.
5. Triumph grapefruit; SO.
6. Triumph grapefruit; SO; foot rot.

Row 9—

Tree 1. Pink pummelo; SO; foot rot.
2. Pink pummelo; SO; foot rot.
3. Lemon variety; SO.
4. Dead; SO.
5. Pineapple orange; SO; foot rot.
6. Pineapple orange; SO; foot rot.
7. Washington navel; SO; foot rot.
8. Washington navel; SO.
9. Jaffa orange; SO; foot rot.
10. Jaffa orange; SO.

Row 10—

Tree 1. Japanese orange (sour); SO; foot-rot lesions sharply delimited above bud union.
2. Japanese orange (sour); SO.
3. Ruby orange; SO; foot rot.
4. Ruby orange; SO.
5. Clark lemon; SO.
6. Clark lemon; SO.
7. Holdfast orange; SO.
8. Holdfast orange; SO.
9. Villa Franca lemon; SO.
10. Villa Franca lemon; SO; foot rot.
11. Out.
12. Out.
13. Bengal lemon; SO.

Row 11—

Tree 1. Mediterranean orange; P.
2. Mediterranean orange; SO; foot rot.
3. Valencia orange; SO.
4. Valencia orange; SO.
5. Ellen grapefruit; SO.

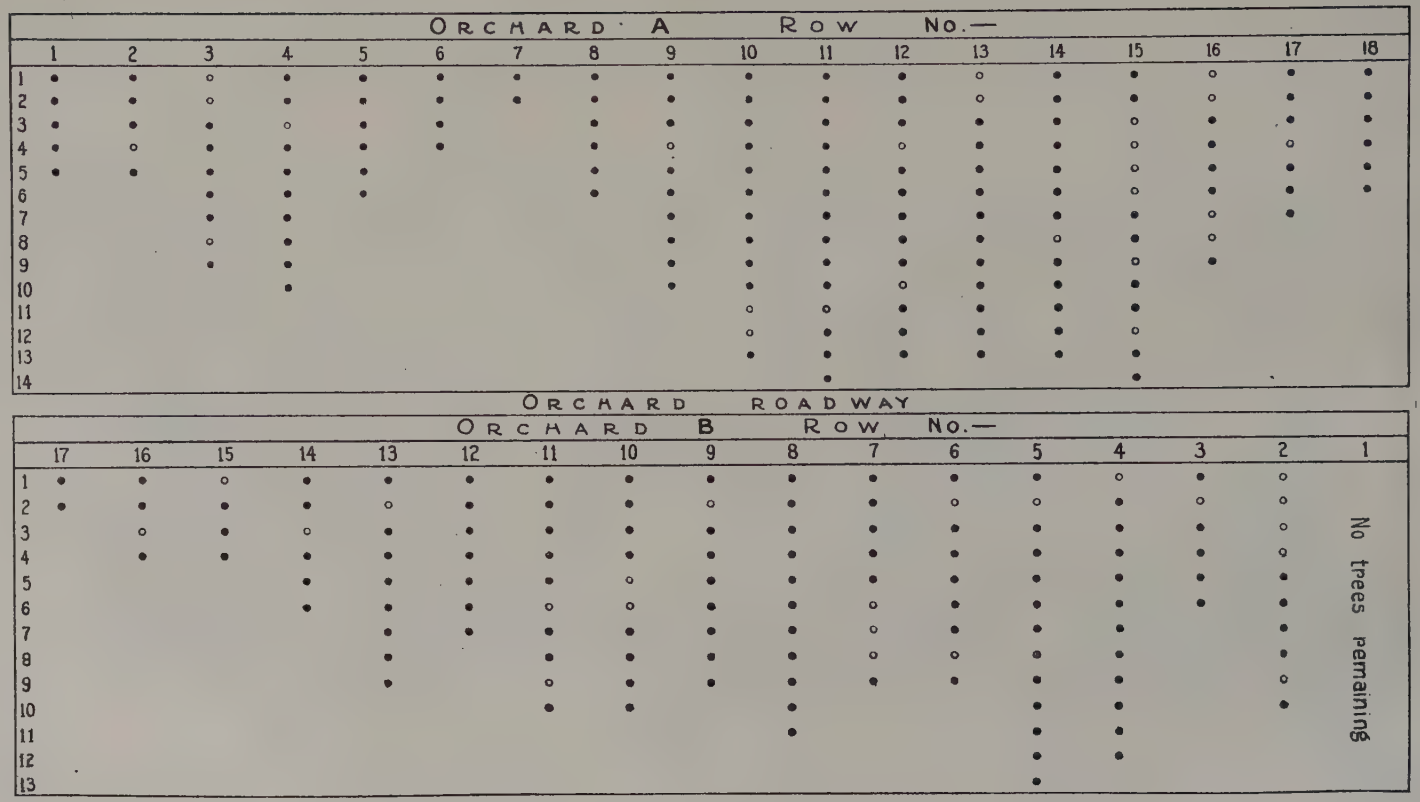


FIG. 1. Diagram of orchards A and B, showing the relative positions of rows and trees.

TABLE 1.—*Showing the occurrence of the various citrus stocks*—Ctd.

Orchard A—Continued.
Row 11—Continued.
Tree 6. Ellen grapefruit; SO.
7. Tahiti lime; SO; foot rot.
8. Tahiti lime; SO.
9. Sicily lemon; SO.
10. Sicily lemon; SO.
11. Dead.
12. Washington navel; SO.
13. Thornless lemon; SO.
14. Thornless lemon; SO.

Row 12—
Tree 1. Triumph grapefruit; SO.
2. Triumph grapefruit; SO.
3. Larantta orange; SO; foot rot.
4. Out.
5. White Siletta; SO.
6. White Siletta; SO; foot rot.
7. Citron; SO.
8. Citron; SO.
9. Calamondin; SO.
10. Out.
11. Jaffa; SO; foot rot.
12. Jaffa; SO; foot rot.
13. Bahia orange; SO.

Row 13—
Tree 1. Out.
2. Out.
3. *Citrus excelsa;* SO.
4. *Citrus excelsa;* SO.
5. Cajel; SO.
6. Cajel; SO.
7. Native lime; SO.
8. Native lime; SO; foot rot.
9. Jaffa orange; SO.
10. Jaffa orange; Cal.
11. *Citrus excelsa;* SO; foot rot.
12. *Citrus excelsa;* Cal.
13. Native lime; SO.

Row 14—
Tree 1. St. Michael orange; SO.
2. St. Michael orange; SO.
3. Kishiu mandarin orange; SO; foot rot.
4. Kishiu mandarin orange; SO.
5. Konda Harun mandarin orange; SO; foot rot.
6. Satsuma; SO.
7. Satsuma; SO.
8. Dead.

TABLE 1.—*Showing the occurrence of the various citrus stocks*—Ctd.

Orchard A—Continued.
Row 14—Continued.
Tree 9. Ruby orange; P.
10. Dancy tangerine; P.
11. Dancy tangerine; P.
12. Sampson tangelo; P.
13. Sampson tangelo; P.
Row 15—
Tree 1. Florida sour orange; P.
2. Florida sour orange; P.
3. Out.
4. Out.
5. Out.
6. Out.
7. *Citrus hystrix;* unknown.
8. *Citrus hystrix;* unknown.
9. Out.
10. Suhat, Philippine *Citrus* species; P.
11. Native lime; SO.
12. Out.
13. Native lime; SO.
14. Native lime; SO.
Row 16—
Tree 1. Out.
2. Out.
3. Native pummelo; SO.
4. Native pummelo; SO.
5. *Citrus webberi;* SO; foot rot.
6. *Citrus webberi;* Cal.
7. Out.
8. Out.
9. Native orange; Cal.
Row 17—
Tree 1. Everbearing lime.
2. Everbearing; unknown.
3. No label.
4. Out.
5. Bellaire; unknown; foot rot.
6. Villa Franca; P.
7. Bellaire; unknown.
Row 18—
Tree 1. Lisbon; P.
2. Lisbon; P; foot rot.
3. Chinese lemon; P.
4. Chinese lemon; P.
5. Excelsior lemon; CE.
6. Native sweet orange; unknown; foot rot.

TABLE 1.—*Showing the occurrence of the various citrus stocks*—Ctd.

Orchard B:

Row 17—
- Tree 1. Sampson tangelo; P.
- 2. Sampson tangelo; P.

Row 16—
- Tree 1. Calamondin; CE; foot rot.
- 2. Calamondin; CE.
- 3. Out.
- 4. Le Nestour lime; unknown.

Row 15—
- Tree 1. Out.
- 2. No label.
- 3. Siamese pummelo; Cal.
- 4. Siamese pummelo; P.

Row 14—
- Tree 1. Calamondin; CE.
- 2. Calamondin; Cal.
- 3. Out.
- 4. No label.
- 5. Boone orange; CE; foot rot.
- 6. Boone orange; Cal.

Row 13—
- Tree 1. Native pummelo; SO.
- 2. Out.
- 3. Siamese seedless pummelo; P.
- 4. Siamese seedless pummelo; P.
- 5. Pongkam mandarin orange; lime.
- 6. No label.
- 7. Malta blood orange; CE.
- 8. No label.
- 9. Native pummelo; Cal.

Row 12—
- Tree 1. Magnum bonum orange; SO.
- 2. Magnum bonum orange; SO.
- 3. No label.
- 4. Carleton orange; SO.
- 5. Royal orange; native *Citrus*.
- 6. Royal orange; native *Citrus*.
- 7. Native pummelo; P.

Row 11—
- Tree 1. Walters grapefruit; Sour.
- 2. Walters grapefruit; Sour.
- 3. Dugat orange; P.
- 4. Dugat orange; P.
- 5. Duroi orange; lime.
- 6. Out.
- 7. McCarthy grapefruit; P.
- 8. McCarthy grapefruit; P.
- 9. Out.
- 10. Tahiti lime; unknown.

TABLE 1.—*Showing the occurrence of the various citrus stocks*—Ctd

Orchard B—Continued.

Row 10—

Tree 1. Replant.
2. Replant.
3. Everglade lime; Cal.
4. Everglade lime; Cal.
5. Out.
6. Out.
7. *Citrus hystrix;* CE.
8. *Citrus hystrix;* CE.
9. Brown orange; SO.
10. Brown orange; SO.

Row 9—

Tree 1. No label; P.
2. Out.
3. *Citrus hystrix;* Cal.
4. *Citrus hystrix;* CE; foot rot.
5. *Citrus hystrix;* Cal.
6. *Citrus hystrix;* Cal.
7. Trinidad lime; Cal.
8. Trinidad lime; Cal.
9. Native lime; CE.

Row 8—

Tree 1. *Citrus webberi.*
2. *Citrus excelsa;* CE.
3. No label.
4. Florida sour orange; P.
5. Native pummelo.
6. *Citrus hystrix;* P.
7. Duroi orange.
8. No label.
9. McCarthy grapefruit; Sour.
10. McCarthy grapefruit; Sour.
11. Le Nestour lime; CE.

Row 7—

Tree 1. No label; P.
2. Duncan grapefruit; P.
3. Pineapple orange.
4. Marsh grapefruit; foot rot.
5. Enterprise orange.
6. Out.
7. Out.
8. Out.
9. Saagkam mandarin orange; Cal.

Row 6—

Tree 1. Replant.
2. Out.
3. *Citrus hystrix;* CE.
4. *Citrus hystrix;* CE.
5. Replant.

TABLE 1.—*Showing the occurrence of the various citrus stocks*—Ctd.

Orchard B—Continued.
Row 6—Continued.
Tree 6. Replant.
7. *Citrus hystrix;* SO; foot rot.
8. Out.
9. Brown sweet orange; CE.
Row 5—
Tree 1. No label.
2. Out.
3. Maltese blood orange.
4. Everbearing orange.
5. Homosassa orange.
6. Maltese blood orange; Cal.
7. McCarthy grapefruit; P.
8. Out.
9. Siamese pummelo; P.
10. Siamese pummelo; P.
11. Suntara mandarin O; CE.
12. Native lime; P.
13. Native lime; P.
Row 4—
Tree 1. Out.
2. Tinder; Cal.
3. Szinkom mandarin O; CE; foot rot.
4. Replant.
5. Florida sour orange; P.
6. Florida sour orange; P.
7. Pineapple orange; Cal.
8. Pineapple orange; CE.
9. King mandarin O; P.
10. King mandarin O; P.
11. Native pummelo; P.
12. Native pummelo; P.
Row 3—
Tree 1. Native lime; CE.
2. Out.
3. Native lime; SO.
4. Native lime; SO.
5. Unknown; CE.
6. Valencia orange; Cal.
Row 2—
Tree 1. Out.
2. Out.
3. Out.
4. Out.
5. Sampson tangelo; P; foot rot.
6. Native lime; Cal.
7. Native lime; Cal.

TABLE 1.—*Showing the occurrence of the various citrus stocks*—Ctd.

Orchard B—Continued.
Row 2—Continued.
Tree 8. Calamondin; unknown.
9. Out.
10. No label.
Row 1—
No trees remaining.

TABLE 2.—*Showing the occurrence of the various citrus stocks throughout orchards A and B and the occurrence of foot rot among these root stocks.*

Stock.	Orchard A.[a]			Orchard B.[b]		
	Total.	Foot rot cases.		Total.	Foot rot cases.	
		Number.	*P. ct.*		*Number.*	*P. ct.*
Sweet orange, *Citrus sinensis*	97	37	38.14	9	1	11.11
Sour orange, *Citrus aurantium*				4	0	0.00
Pummelo, *Citrus maxima*	15	1	6.66	27	1	3.70
Calamondin, *Citrus mitis*	9	0	0.00	18	0	0.00
Limon real, a native Philippine citrus fruit, *Citrus excelsa*	3	0	0.00	19	4	21.05
Lime, *Citrus aurantifolia*	1	0	0.00	2	0	0.00

[a] Orchard A was eight years old at the time of the observation.
[b] Orchard B was five years old at the time of the observation.

The foregoing data first of all show the seriousness of foot rot in the Philippine Islands. It is readily apparent that the limon real (*Citrus excelsa*) which, because of its vigorous aërial growth, has been considered for use as a root stock, is hardly feasible, at least under Philippine conditions. Of the nineteen trees grown on this stock in the five-year-old orchard, 21 per cent showed the disease; it is evident that an orchard on this stock would be very short-lived. Of probably more ready appreciation is the extreme susceptibility of the sweet orange as a root stock. In the eight-year-old orchard more than 37 per cent of the trees showed the disease. The pummelo as a stock seems much more resistant than either the sweet orange or the limon real, showing 6 per cent of the trees affected in the older orchard and 3.74 per cent in the five-year-old orchard. As there were only four trees with sour orange stocks and two trees with lime stocks, the data are far from comprehensive on these two species. The calamondin as a stock is by far the most noteworthy, from these data, and would seem to be resistant to the disease.

Hume,(4) from field observations in Florida, drew the conclusion that stocks showed susceptibility to foot rot in the following

order: Sweet orange, lemon, rough lemon, pummelo, and sour orange. The present data, being based upon actual count, strongly support Hume's order of susceptibility and, in addition, point out the possibilities of the calamondin as a stock for citrus trees and the extreme susceptibility of *Citrus excelsa* as a stock.

The calamondin as a stock for the Valencia orange formed a very poor bud union, it may be noted from Table 1. On the other hand, the Oneco mandarin orange on this stock formed a notably good bud union. The use of the calamondin as a stock for some of the *Citrus* species is worthy of a trial.

It would seem desirable in this connection to point out the predisposition to mottled leaf of citrus trees budded on pummelo stock, shown by Lee in a previous paper.(5) Such predisposition, even though the pummelo as a stock does seem from the foregoing data to be but slightly susceptible to foot rot, would militate against the extensive use of the pummelo under Philippine conditions and its use would be advisable with caution, at least, in other countries. One is led to conclude that the limon real and the sweet orange must be ruled out as stocks for citrus trees in the Philippines, because of their susceptibility to foot rot. The pummelo must be ruled out because it predisposes to mottled leaf citrus trees for which it has been used as a stock. The promising stocks, shown in this paper and the previous paper,(5) are the calamondin, various kinds of the mandarin orange, and the sour orange.

REFERENCES

1. FAWCETT, H. S. Citrus diseases of Florida and Cuba compared with those of California. Bull. Calif. Agr. Exp. Sta. 262 (1915) 159.
2. FAWCETT, H. S. The known distribution of Pythiacystis citrophthora and its probable relation to mal di gomma of Citrus. Phytopath. 5 (1915) 66.
3. GALLOWAY, B. T. A record of some of the work of the division. U. S. Dept. Agr., Bot. Div. Bull. Part II 8 (1889) 51.
4. HUME, H. HAROLD. Citrus fruits and their culture. H. and W. B. Drew Co., Jacksonville, Florida (1904) 472.
5. LEE, H. ATHERTON. The relation of stocks to mottled leaf of citrus trees. Philip. Journ. Sci. 18 (1921) 85.
6. SHERBAKOFF, C. D. Buckeye rot of tomato fruit. Phytopath. 7 (1917) 119.
7. STEVENS, H. E. Florida citrus diseases. Bull. Florida Agr. Exp. Sta. 150 (1918) 43.
8. SWINGLE, WALTER T. and HERBERT J. WEBBER. The principal diseases of citrus fruits in Florida. U. S. Dept. Agr., Bull. Div. Veg. Physiol. Path. 8 (1896).

ILLUSTRATIONS

PLATE 1

FIG. 1. Foot rot on grapefruit tree with sweet orange stock. The lesion can be seen to extend down onto the root and well up above the soil.

2. The same lesion as that shown in fig. 1, but the bark has been cut away around the lesion as a remedial treatment and will be disinfected. The callus can be noted, formed by the host plant in an effort to heal over the lesion.

TEXT FIGURE

FIG. 1. Diagram showing the layout of orchards A and B at the Lamao Horticultural Station and the occurrence of foot rot throughout these orchards.

Fig. 1. Foot rot on grapefruit tree.

Fig. 2. Lesion after treatment.

PLATE 1.

DIE TENEBRIONIDEN (COLEOPTERA) DES INDO-MALAYISCHEN GEBIETES, UNTER BERUECKSICHTIGUNG DER BENACHBARTEN FAUNEN, V

DIE GATTUNG CEROPRIA

Von HANS GEBIEN

Hamburg, Germany

EINE TAFEL

Genus CEROPRIA Castelnau und Brullé

Ceropria CASTELNAU und BRULLÉ, Ann. Sc. Nat. (1829) 396; LACORDAIRE, Gen. Col. 5 (1859) 307; HAROLD, Stett. Ent. Zeitg. 38 (1877) 345–355.

Die Gattung *Ceropria* enthält in den tropischen und subtropischen Gebieten von Afrika, Asien, und Australien 40 bisher benannte Arten. In den Sammlungen ist am häufigsten *C. induta* Wiedemann zu finden, die im indischen und malayischen Gebiet gemein ist. Aus diesem Grunde ziehe ich die Art häufiger zum Vergleich heran, auch wenn ein Vergleich mit einer anderen, eben seltneren Art passender gewesen wäre. Aus Afrika kannte man bisher 3 Arten, von denen nur 2 gut geschieden sind, *C. romandi* und *C. anthracina;* die dritte ist wohl kaum etwas anderes als eine madegassische Rasse von *romandi.* Aber ausser diesen 3 besitze ich noch 5 ausgezeichnete neue afrikanische Arten, so das also auch in diesem Erdteil die Gattung gut vertreten ist. Auch aus dem papuanischen Gebiet habe ich (Nova Guinea XIII) noch einige Arten beschrieben. Aber nirgend ist die Gattung so gut entwickelt wie in Asien; hier finden sich die verschiedensten Formen, herrliche Farben und zahlreiche Arten. Harold hat in seiner Monographie versucht die Arten nach der Färbung zu trennen. Der Versuch kann nicht als geglückt angesehen werden; übrigens kannte er auch nur einen Bruchteil der wirklich vorhandenen Arten. Meist sind die Arten mit metallisch Regenbogenfarben geschmückt; daher ist Zeichnung und Färbung in Worten oder im Bild schwer wiederzugeben. Erfreulicherweise liegt

mir das von ihm bearbeitete Material des Berliner Museums vor, so dass ich über seine Arten und die Auffassung die der Autor von den bekannten Arten hatte nicht im Zweifel bin. Dagegen bin ich bei der Deutung der Arten französicher Autoren auf die Beschreibung angewiesen, die leider oft sehr zu wünschen übrig lässt.

Auf Grund der Untersuchungen von Typen, von sorgfältigem Studium der Beschreibungen und brieflichen Mitteilungen des Herrn Blair können folgende Aenderungen in meinem Catalog [1] vorgenommen werden.

Ceropria axillaris Chevrolat, 1878 = *C. humeralis* Harold, 1877.
Ceropria chrysosticta Hope, 1842 = *C. superba* Wiedemann, 1823.
Ceropria femorata Motschulsky, 1873 = *C. erythrocnema* Castelnau und Brullé, 1831.
Ceropria impressifrons Fairmaire, 1882 = *C. versicolor* Castelnau und Brullé, 1831.
Ceropria pulchra Hope = *Hemicera zigzaga* Marseul.
Ceropria violacea Blanchard ist eine Cnodalonide aus der Verwandtschaft von *Chariotheca*.
Ceropria insignis Chevrolat ist nach Blair [2] = *intermedia* Harold.
Ceropria iris Chevrolat kann ich nicht deuten; sie ist wahrscheinlich keine *Ceropria*.

Lacordaire's Beschreibung der Gattung ist gut. Die Hauptmerkmale sind die beim Männchen stets erweiterten Vordertarsen und die geknickten Vorder- und Mittelschienen in diesem Geschlecht, die Fühlerglieder sind meist kräftig gesägt. Sehr kompliziert ist der Bau der männlichen Geschlechtswerkzeuge. Ausser dem häutigen Penis, dessen chitinigen Parameren stets zu einer Röhre verwachsen sind, finden sich auffallende äussere und innere Nebenklappen. Dieser Geschlechtsapparat ist so gewaltig, dass er eine weitgehende Oeffnung der Analklappe nötig macht. Bei der *versicolor*-Gruppe sind daher das dritte und vierte Abdominalsegment bis zur Mitte häutig.

Nach Harold könnte man annehmen, das plastische Merkmale so gut wie ganz in der Gattung fehlen. Das ist aber durchaus nicht der Fall. So zeigen mehrere Arten eigentümliche Ausbildung der Deckenspitzen, auch die Dichte der Punkte in den Reihen ist sehr verschieden, neben Arten mit circa 30 bis 40 Punkten in dem vierten Streif finden sich andere mit 60, 80, 100 bis 120 Punkten. Im übrigen kann ich mit Harold fest-

[1] Col. Cat. pars 28 (1910–1911) 382.
[2] Trans. Zool. Soc. London 20 (1915) 535, pl. 16.

stellen, dass die Färbung mit Ausnahme der *induta*-Gruppe recht beständig ist.

Bestimmungstabelle für die asiatischen Arten der Gattung Ceropria.

1. Die mittleren Abdominalsegmente des Männchens sind bis zur Hälfte verkürzt und haben daher eine ausserordentlich breite Gelenkhaut, die Fühlerglieder sind nicht gesägt, sondern innen leicht rundlich erweitert, Stirn mit tiefem Eindruck ..... 2.
   Gelenkhaut der Abdominalsegmente schmal, normal, Fühler kräftig, oft auffallend gesägt, Stirn selten mit Eindruck ..... 4.
2. Oberseite einfarbig bräunlich bronze, Schenkel rot (*femorata* Motschulsky). (Sumatra, Java.) .. C. erythrocnema Castelnau und Brullé.
   Oberseite mit goldigen Binden, Halsschild mit O-förmiger Makel an jeder Seite, Schenkel schwarz ..... 3.
3. Die Spitzenmakel der Decken ist vorn als Querbinde ausgebildet, eine Längsbinde an den Seiten fehlt dort. O-Makel des Pronotums unterbrochen, Flügeldecken mit gut ausgebildeter Spitze, beim Weibchen mit Knötchen, Analsegment des Weibchens jederseits ungefurcht. (Sunda-Inseln, Hinterindien, Süd-China.) ..... C. superba Wiedemann.
   Die Spitzenmakel der Decken besteht aus zwei Längsstreifen an der Naht und am Aussenrand, O-Makel des Pronotums geschlossen, Spitze der Decken in beiden Geschlechtern abgestutzt, Männchen mit winzigen Ausschnitt an den Epipleuren unmittelbar vor der Spitze, beim Weibchen ist das Analsegment jederseits fein gefurcht. (Sunda-Inseln, Hinterindien, Ceylon.) ..... C. versicolor Castelnau und Brullé.
4. Flügeldecken nicht mit roten Binden ..... 5.
   Flügeldecken mit roten, nicht metallischen Querbinden oder Flecken .. 22.
5. Die Punkte der Streifen sind kräftig, weniger als 40 Punkte stehen im vierten Streif ..... 6.
   Punkte der Streifen viel feiner, 60 bis 120 im vierten Streif ..... 7.
6. Flügeldecken in den herrlichsten Farben prangend, Halsschild purpurn violett, Basis bei den Grübchen kaum aufgebogen. (Borneo.)
   C. speciosissima Gebien.
   Flügeldecken auf den ersten Blick fast einfarbig düster metallisch, mit sehr schmaler, regenbogenfarbener Kreisbinde an Schulter und Spitze, Halsschild schwärzlich mit schwachem, goldigen Fleck, an der Basis neben dem Grübchen kräftig, aber schmal aufgebogen.
   C. decolorata sp. nov.
7. Flügeldecken mit stark metallischem Schulter- und Spitzenfleck, der in Regenbogenfarben schillert, oder es sind die matteren Flecken von irisierenden Linien begrenzt ..... 8.
   Flügeldecken einfarbig oder doch ohne irisierende Flecken und Linien ..... 14.
8. Die Stirn mit kräftigem Längseindruck. Hinterschienen des Männchens an der Spitze oben mit kleinem Eindruck ..... 9.
   Die Stirn nicht eingedrückt, Hinterschienen meist ohne den kleinen Eindruck (hierher auch die mir unbekannte *C. striata* Lewis) .... 10.
9. Halsschild herrlich metallisch gefärbt, auch in der Mitte, Punktierung der Streifen weniger eng (circa 80 Punkte im zweiten Streif). (Japan.) ..... C. sulcifrons Harold.

Halsschild schwach metallisch, in der Mitte schwärzlich, Deckenstreifen sehr eng (über 100 Punkte im zweiten Streif). (Formosa.)
C. formosana Gebien.

10. Schienen sehr dick, die hinteren am Ende oben beim Männchen mit Eindruck, Flügeldecken ziemlich düster gefärbt mit feinen, irisierenden Kreisen an Schulter und Spitze, aber nicht anders gefärbten Flecken. Ueber 100 Punkte im vierten Streifen. (Sumatra.)
C. amplipennis sp. nov.

Schienen dünn, normal, die hinteren beim Männchen ohne Eindruck, Flügeldecken mit regenbogenfarbenem Schulter- und Spitzenfleck, bis 80 Punkte im vierten Streif ..... 11.

11. Die Vorderschienen des Männchens sind gerade, die mittleren schwach gebogen. Sehr breite Art, von 12 Millimeter und darüber. (Hinterindien, Tonkin, Japan.) ..... **C. laticollis** Fairmaire.

Flügeldecken leuchtend purpur-violett. (Formosa.)
C. laticollis var. schenklingi Gebien.

Vorder- und Mittelschienen des Männchens geknickt und in der Endhälfte leicht tuberkuliert; circa 10 Millimeter grosse Arten ..... 12.

12. Auch der Vorderkörper lebhaft metallisch, Kopf blau. Körper sehr breit, Pronotum in der Mitte am breitesten, nach hinten schwach verengt. Vorderschienen des Männchens stark geknickt, und mit kräftigem Ausschnitt in der Mitte, Analsegment beim Männchen gerade abgeschnitten und eingedrückt. Sehr buntgefärbte Art von den Philippinen ..... **C. mindanaica** sp. nov.

Kopf schwärzlich, Pronotum selten lebhaft metallisch. Körper lang oval, Pronotum an der Basis am breitesten. Vorderschienen schwach geknickt und undeutlich ausgeschnitten. Analsegment einfach .... 13.

13. Halsschild auch in der Mitte schön metallisch, ungefähr 60 Punkte im vierten Streif; sehr bunte Art von Sumatra ..... **C. opulenta** Harold.

Halsschild in der Mitte schwärzlich, ungefähr 80 Punkte im vierten Streif, weniger bunte Art. (Ceylon, Indien, Japan, China, Sunda-Inseln, Philippinen, Celebes.) ..... **C. induta** Wiedemann.

Schmal, Decken deutlicher gefurcht, Zwischenräume kaum punktiert. Stammform Form und Skulptur der vorigen, Decken purpurfarben, selten mit breiter, goldigen Querbinde oder goldiger Naht. (Besonders Ceylon und Indien.) ..... **C. induta var. purpurina var. nov.**

Breiter, Decken mit Punktlinien, Zwischenräume kräftiger punktiert.
C. induta subsp. subocellata Castelnau und Brullé.

14. Oberseite leuchtend purpurviolett, selten in der Mitte mit Spur von Goldbinde ..... 15.

Oberseite stark metallisch oder düster schwarz, braun, blau, nicht purpurn ..... 16.

15. Breite, grosse Art, Zwischenräume vollkommen flach, Vorderschienen des Männchens gerade. (Formosa.)
C. laticollis var. schenklingi Gebien.

Schmale, kleine Art. Zwischenräume gewölbt, Vorderschienen geknickt. (Indien, Ceylon.) ..... **C. induta var. purpurina var. nov.**

16. Oberseite stark metallisch, Zwischenräume flach, Halsschild violett oder mit Goldflecken. Grosse Arten ..... 17.

Oberseite düster schwarz, braun, schwarzblau, Zwischenräume mehr oder minder gewölbt, Halsschild düster gefärbt. Kleinere, schmale Arten von der Gestalt der *C. induta* ..... 19.

17. Schulterbeule stark erhaben, Epipleuren prächtig violett, Stirn mit Längseindruck, Deckenspitze des Weibchens mit kurzem Schwänzchen, Halsschild mit zahlreichen Goldflecken. (Malacca.)
C. caesarea sp. nov.

Schulterbeule schwach, normal, Epipleuren schwarz, Stirn ohne Eindruck, Deckenspitze des Weibchens breit verrundet, Halsschild ohne Goldflecken ..... 18.

18. Flügeldecken leuchtend feurig rot, an jeder Seite vor der Mitte, hart über dem Seitenrand mit Eindruck. Punktlinien der Decken nicht eingeschnitten. (Philippinen.) ..... **C. pyritosa sp. nov.**

Flügeldecken düster metallisch, schwach goldig, an jeder Seite am Rande ohne Grübchen, Punktlinien der Decken fein eingeschnitten. (Sumatra.) ..... **C. medanensis sp. nov.**

19. Stirn mit Punktgrübchen, blauschwarze, schwach glänzende Art, Mittelschienen des Männchens fast gerade, ohne Ausschnitt vorn, Flügeldecken mässig gefurcht. (Buru, Amboina.) ..... **C. subnigra sp. nov.**

Stirn ohne Grübchen; Männchen, Vorder- und Mittelschienen kräftig geknickt und mit leichtem Ausschnitt vorn in der Mitte ..... 20.

20. Decken tief gefurcht, 10 Millimeter und grösser, Mittelschienen beim Männchen stark geknickt, mit kräftigem Ausschnitt im Knick. (Timor.) ..... **C. tristis Harold.**

Decken fein punktiert gestreift, Zwischenräume flach oder schwach gewölbt, Mittelschienen des Männchens schwächer geknickt und schwach ausgeschnitten ..... 21.

21. Körper schwarzbraun, glänzend, Zwischenräume der Decken flach, sehr fein aber deutlich punktiert, Fühler einfarbig rotbraun. (Saleyer, ex Fairmaire.) ..... **C. dolorosa Fairmaire.**

Körper hellbraun, matt, die mittleren Zwischenräume sehr stumpf gekielt, fast unpunktiert, Fühler rotbraun mit dunkler Basis der Glieder. (Philippinen.) ..... **C. mindorensis sp. nov.**

22. Flügeldecken nur mit rotem Schulterfleck. Breit oval, blau, Unterseite schwarz. (Amboina.) ..... **C. humeralis Harold.**

Flügeldecken mit vorderer querer Binde und einem Spitzenfleck, Unterseite rotbraun, schmälere, meist braune Arten ..... 23.

23. Oberseite blau, die vordere Binde geht über beide Decken ohne Unterbrechung bei der Naht. (Indien.) ..... **C. bifasciata Chevrolat.**

Oberseite braun, die vordere Binde ist durch die Naht unterbrochen.. 24.

24. Flügeldecken hinten tief gefurcht, der hintere Fleck ist länglich und beiden Decken gemeinsam, er nimmt die beiden inneren Zwischenräume ein, Mittelschienen des Männchens scharf gesägt. (Tenasserim.) ..... **C. serripes sp. nov.**

25. Kopf zwischen den Augen eingedrückt, der hintere Fleck berührt die Naht nicht, Fühlerglieder dreieckig. (Borneo, ex Fairmaire.)
C. rufofasciata Fairmaire.

Kopf zwischen den Augen nur mit Spur von Eindruck, hinterer Fleck an der Naht hinten mit dem Andern verbunden. Fühlerglieder stark quer. (Arraianküste.) ..... **C. vidua sp. nov.**

Ceropria superba Wiedemann. Tafel 1, Fig. 1 und 2.

Ceropria superba WIEDEMANN, Zooł. Mag. (1823) 43; HAROLD, Stett. Ent. Zeitg. 38 (1877) 350; GEBIEN, Sarawak Mus. Journ. 2 (1914) 20, 21.

Ceropria chrysostica HOPE, Trans. Ent. Soc. London (1845) 16.

Ceropria festiva CASTELNAU und BRULLÉ, Ann. Sc. Nat. (1829) 400, t. 10, f. 4*a*, *b*.

Ceropria paykulli DALMAN, Anal. Entom. (1823) 60.

Sehr weit verbreitet: Unter-Burma, Moulmein. Malacca, Perak (*Grubauer*); Tenasserim (*Helfer*). Süd-China, Canton. Sumatra, Medan; Soekaranda (*Dohrn*). Mentawei, Si-Oban, April-August, 1894 (*Modigliani*). Java, ohne genauere Angaben. Borneo, Njabang; Kuching, November 1, 1899 (*Moulton*).

Es ist auffällig dass alle Beschreibungen, auch die Monographien von Castelnau und Brullé und Harold, wohl eingehend die charakteristische Zeichnung der Decken geben, und selbst auf Nebensächliches eingehen, dass sie aber im übrigen die wichtigen plastischen Merkmale vernachlässigen. Daher sind einige Ergänzungen nicht überflüssig. Eine Verwechslung kann nur mit der ähnlich gezeichneten folgenden Art eintreten. Auf die Unterschiede habe ich aufmerksam gemacht.[3]

Die Stirn, welche nach vorn stark verschmälert ist, ist dort merklich breiter als der Querdurchmesser eines Auges, vor diesen findet sich ein kräftiger Quereindruck. Die Fühler sind am Grunde sehr schlank, Glied 3 und 4 sind viel länger als breit, 5 und 6 so breit wie lang, die folgenden quer, 10 fast doppelt so breit wie lang, auch 11 ist quer. Die Glieder sind nicht gesägt, sondern die Lappen haben nach innen eine stark verrundete Spitze. Die Stirn ist in beiden Geschlechtern eingedrückt. Die Zeichnungen auf Pronotum und Flügeldecken sind schmale Goldbinden auf kupferbraunem Grunde. Die des Pronotums bestehen aus einem mittleren, länglichen Fleck und jederseits am Rande einer O-förmigen grossen Makel, die aber im Gegensatz zur nächsten Art nicht ganz geschlossen ist, sondern nach hinten offen. Ich glaube dieses Merkmal ist konstant, wenigstens habe ich bei den 28 mir vorliegenden Stücken keine Abweichung gefunden, bei *versicolor* dagegen ist das O geschlossen. Die Binden, auch die der Decken, sind verhältnismassig schmal und gut wenn auch nicht scharf begrenzt. Vorn befindet sich in der Mitte ein länglicher Fleck neben dem Schildchen, in der Mitte eine gezackte Querbinde, die vom Rande bis zum Nahtstreif läuft. An der Spitze findet sich im zweiten Zwischen-

[3] Sarawak Mus. Journ. 2 (1914) 21.

raume eine von der Spitzenecke bis zum letzten Viertel reichende Goldbinde, die nach aussen biegt und bis zum Rande geht, dieser quere Teil ist meist breiter. Die Binden der Decken variieren etwas. Die Spitze ist nicht abgeschnitten, sondern im Gegenteil schwach ausgezogen, einzeln verrundet, das äusserste Ende beim Weibchen etwas verdickt. Die Vordertarsen des Männchens sind kräftig verbreitert, die Mittelschienen in diesem Geschlecht leicht gekrümmt, nicht geknickt, gegen das Ende nicht breiter, leicht tuberkuliert.

Ceropria versicolor Castelnau und Brullé. Tafel 1, Fig. 3.

Ceropria versicolor Castelnau und Brullé, Ann. Sc. Nat. (1829) 401; Harold, Stett. Ent. Zeitg. 38 (1877) 351.

Ceropria impressifrons Fairmaire, Notes Leyd. Mus. 4 (1882) 222; Gebien, Sarawak Mus. Journ. 2 (1914) 21.

Mir liegen aus allen Sammlungen über 70 Tiere vor. Ceylon (*Nietner*). Ostindien. Siam (*Wallace*). Malacca, Perak; Tenasserim; Thagata, April, 1897 (*L. Fea*); Tenasserim; Meelam, April, 1887 (*Fea*). Pulo Penang. Sumatra, Manna (*Knappert*); Padang Pandjang; Deli (*L. Martin*); Soekaranda (*Dohrn*). Java, Semarang, Mai, 1906 (*Drescher*); Tjiamio, April, 1907 (*Drescher*); Boemi Ajoe. Borneo, Sarawak (*Wallace*); Südost Borneo (*Grabowsky*).

In der Zeichnung unterscheidet sich diese Art von der vorigen, mit welcher allein sie verwechselt werden kann, gut. Die beiden O-förmigen Binden an der Seite des Halsschildes sind geschlossen, nur bei einem einzigen der mir vorliegenden Tiere leicht unterbrochen. Die Spitzenmakel ist ganz anders und besteht aus zwei langen, goldigen Längswischen, einem am Aussenrand und einem an der Naht bis zur Spitze, eine Querverbindung beider weit vor der Spitze, wie sie bei voriger Art vorhanden ist, fehlt. Das wichtigste plastische Merkmal besteht in der Bildung der Deckenspitzen. Diese sind in beiden Geschlechtern breit abgestutzt oder breit lappenförmig verrundet, beim Weibchen sind die Spitzen kräftig gemeinsam niedergezogen, beim Männchen findet sich ein kleiner, nicht eben deutlicher Ausschnitt an der Aussenseite der Epipleuren unmittelbar vor der Spitze. Ferner ist beim Weibchen das Analsegment jederseits gefurcht und mit kurzer Spitze versehen. Das ist wieder ein Beispiel dafür, dass auch bei den Weibchen von Tenebrioniden positive Geschlechtsmerkmale vorkommen. Sehr auffällig ist für diese Art für *superba* und *erythrocnema* die Bildung des Abdomens beim Männchen; der gewaltige Geschlechtsapparat braucht grosse Bewegungsfreiheit, die Analklappe muss weit

geöffnet werden, die Chitinringe des dritten und vierten Segmentes sind daher stark verschmälert und dementsprechend die Gelenkhäute bis auf die halbe Segmentbreite vergrössert. Dieses von allen Autoren bisher übersehene Merkmal kommt nur den drei erwähnten Arten zu.

Ceropria erythrocnema Castelnau und Brullé.

Ceropria erythrocnema CASTELNAU und BRULLÉ (*erythroctena* err. typ.) Ann. Sc. Nat. (1829) 402; HAROLD, Deutsche Ent. Zeitschr. 22 (1878) 350.

Ceropria femorata MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 46 (1872) 476.

Nach Motschulsky's Beschreibung kann wohl kaum ein Zweifel sein, dass *femorata* etwas anderes ist als *erythrocnema*, die er nicht kennt, sie nicht einmal erwähnt.

Die Art scheint selten zu sein. Mir liegen nur 8 Tiere vor, davon 5 aus meiner Sammlung.

Borneo, Sandakan (*Baker*). Java, ohne genauere Angabe. Sumatra, Padang Pandjang; Manna (*Knappert*).

In den Sammlungen Berlin, München, Hamburg, und Gebien.

Diese Art bildet mit den beiden vorigen zusammen eine besondere Gruppe, ausgezeichnet durch die eigentümliche Abdominalbildung des Männchens, die ich bei der vorigen Art genauer beschrieben habe. Sie ist an der Färbung leicht zu erkennen, denn sie ist die einzige indo-malayische Art mit roten Schenkeln, überhaupt die einzige bisher bekannte mit diesen Merkmal. Doch besitze ich 2 neue afrikanische rotschenkelige Arten. Die Flügeldecken sind einfarbig kupferbraun, bei Ansicht gegen das Licht etwas goldig, Zeichnungen und Makeln fehlen. Die Stirn ist eingedrückt, in beiden Geschlechtern nur wenig breiter als ein Auge im Querdurchmesser. Das Epistom ist gerade abgeschnitten, sehr breit, und hat deutliche Aussenecken, die Fühlerglieder sind kräftig erweitert, dreieckig, auch die vorletzten sind kaum quer. Der Halsschild ist goldig und hat jederseits einen erloschenen, kupferbraunen Fleck. Die Spitzen der Decken sind nicht abgeschnitten oder verrundet. Jede leicht vorgezogene, gut ausgeprägte Spitze ist mit einem Knötchen versehen, beim Weibchen leicht heruntergezogen. Die Vordertarsen des Männchens sind kräftig erweitert, die Vorderschienen nicht geknickt, die Mittelschienen lang und dünn, ganz leicht S-förmig geschwungen, ohne Zähnchen oder Körnchen innen. Das Analsegment des Weibchens hat jederseits eine feine Randfurche und

wird oft, wie bei den verwandten Arten, einwärts gekrümmt getragen.

Ceropria speciosissima Gebien.

Ceropria speciosissima GEBIEN, Sarawak Mus. Journ. 2 (1914) 19.

Von dieser herrlich gefärbten Art liegen mir jetzt 2 Weibchen vor. Sie ist an der weitläufigen Punktierung der Decken zu erkennen; die Punkte stehen in Linien, nicht in Furchen, im vierten Streif sind nur circa 33 Punkte vorhanden, bei andern Arten mehr als das doppelte bis 120 Punkte. Ich möchte annehmen dass das Männchen geknickte Vorderschienen hat und verbreiterte Mittel- und Hinterschienen. Da die Beschreibung ausführlich ist, verzichte ich auf eine Wiederholung.

Borneo, Limbang, April, 1910 (*Moulton*). Sumatra, Soekaranda (*Dohrn*).

In den Sammlungen Stettin und Gebien.

Ceropria decolorata sp. nov.

Breiter als *C. induta*. Unterseite und Beine schwarz. Vorderkörper sehr dunkel, aber bunt metallisch, Flügeldecken schwärzlich kupfrig, Schulter und Spitzen ebenso gefärbt, der Fleck von einem sehr zarten, regenbogenfarbenen Rand umflossen.

Der Kopf ist stark quer, die Augen quellen stark aus der Wölbung des Kopfes, die Stirn ist vorn zwischen ihnen ungefähr halb so breit wie der Querdurchmesser eines Auges, sie ist gewölbt, eine Längsfurche fehlt, die Clypealsutur, die Vorderecken des Auges miteinander verbindend, ist tief eingedrückt. Die Wangen verengen sich fast geradlinig nach vorn, das Epistom ist so lang wie die Stirn vorn zwischen den Augen, es ist gerade abgestutzt, seine Ecken sind zwar stumpf aber deutlich. Die Punktierung ist äusserst fein. Die Fühler sind lang und stark gesägt, die Glieder vom vierten an dreieckig, so lang wie an der Spitze breit, die Ecken scharf.

Der Halsschild ist in der Mittellinie kaum mehr als halb so lang wie an der Basis breit. Die Färbung ist schwärzlich metallisch mit einigen schwachen, purpurnen Längsflecken. Die Basaleindrücke sind tief, länglich grübchenförmig, die Basis ist hinter den Eindrücken und daneben leicht aufgebogen, wodurch sie fast gerandet erscheint. Die Spitze ist in der Mitte gerade, die Vorderecken treten sehr breit und kräftig vor, sind aber in

der Randkante breit verrundet. Die basale Hälfte des Pronotums ist parallelseitig, die Hinterecken sind daher ziemlich scharf rechtwinklig. Die Punktierung ist sehr fein, vorn erloschen, bei den Eindrücken etwas deutlicher.

Die Flügeldecken sind verhältnismässig breit, kräftig gewölbt, der Seitenrand ist von oben gerade noch vollständig sichtbar. Die Färbung ist viel schwächer als bei anderen Arten. Es findet sich je ein grosser Humeral- und Apikalfleck von der Grundfärbung der Decken (schwärzlich kupfrig); diese Flecken werden nur wegen ihres schmalen, farbigen Randes deutlich (von innen nach aussen, schwach goldig, grünlich, blau, purpurrot), so entsteht über die Mitte der Scheibe eine ziemlich schmale, durch die erwähnten Ränder eingefasste Binde. Die bunten Ränder reichen bis zum Nahtstreifen. Die Punktlinien liegen auf volkommen flachem Grunde, ihre Punkte stehen weitläufig (circa 36) im vierten Streif. Die Spitzen sind gemeinsam breit verrundet, von der Seite gesehen nicht herabgezogen, der Nahtstreif ist dort leicht vertieft.

Das Prosternum ist vorn kräftig gekielt, zwischen und hinter den Hüften gerandet, wagerecht. Die Ecken des Mesosternums treten vor. Das Abdomen des Männchens hat nur die normale, schmale Gelenkhaut, alle Schenkel sind dick, sparsam, kurz, gelb beborstet. Die Vorder- und Mittelschienen des Männchens sind stark geknickt, die vorderen in der Endhälfte innen leicht tuberkuliert, die mittleren etwas schwächer. Die Vordertarsen sind kräftig verbreitert, die Hinterschienen sind dünn, am Ende oben mit kleinem Eindruck, an den Hintertarsen ist Glied 1 so lang wie der Rest.

Länge, 10.5 Millimeter; Breite, 5.4.

Ein Männchen aus dem indo-malayischen Gebiet ohne genauere Angaben; in meiner Sammlung.

Trotzdem ich den genauen Fundort dieser Art nicht weiss, beschreibe ich sie doch unbedenklich, da sie nicht zu verkennen ist; nur sie und die vorige Art haben so weitläufige Punkte (weniger als 40 im vierten Streif). Sie ist von ihr, die in den herrlichsten Farben prangt, durch auf den ersten Blick fast einfarbig kupfrig schwärzliche Oberseite zu unterscheiden, hat viel schmälere Hinterschienen, und eine bei den Grübchen deutlich aufgebogene Halsschildbasis. In der Färbung der Decken sieht ihr *C. amplipennis* ähnlich, hat aber einen violetten Halsschild und enge Punktierung der Streifen.

Ceropria formosana Gebien.

Ceropria formosana GEBIEN, Arch. Nat. 79 1913 (1914) Abt. A, Heft 9, 20.

Ueber diese Art und die ihr nahe verwandte *C. sulcifrons* habe ich an anderen Ort ausführlich berichtet. Neues Material liegt mir nicht vor.

Formosa.

Ceropria sulcifrons Harold.

Ceropria sulcifrons HAROLD, Stett. Ent. Zeitg. 37 (1877) 353; LEWIS, Ann. & Mag. Nat. Hist. VI 13 (1894) 399.

Ueber Diese Art haben Harold, Lewis, und ich berichtet. Die Typen des Museums Berlin, die mir jetzt vorliegen, zeigen aber eine falsche Auffassung der Art; es sind mit ihnen 3 Exemplare der *C. induta* vermischt. Ich glaube nicht dass das Versehen auf Harold zurückzuführen ist, der beide Arten wohl zu trennen weiss. Die betreffende Stücke der *induta* stammen ebenfalls aus Japan und diesen Fundort (Japan, *Hilgendorf*) führt er ausdrücklich bei *induta* an, aber unter den zahlreichen Exemplaren dieser Art im Museum Berlin fehlen japanische Stücke ausser den eben genannten dreien. Ich vermute also dass diese später versehentlich zu *sulcifrons* gesteckt wurden, mit der *induta* flüchtige Aehnlickkeit hat. *Ceropria sulcifrons* ist viel lebhafter gefärbt, hat einen stark metallischen Halsschild mit Kupferflecken, eine eingedrückte Stirn, ist wesentlich grösser, und hat viel gröbere, weitläufigere Punkte der Decken.

Nur aus Japan bekannt.

Ceropria amplipennis sp. nov. Tafel 1, Fig. 4 und 5.

Sehr breit oval, flach. Unterseite schwarz, Kopf metallisch, Halsschild blaugrün oder violett mit goldigen oder goldgrünen Seiten. Flügeldecken bei flüchtigem Anblick einfarbig, düster braun-bronze, da Schulter- und Apikalfleck nicht durch andere Färbung abgehoben sind, beide durch schmale, irisierende Bänder begrenzt.

Der Kopf hat eine kräftig gebogene Stirn, auf der sich nur die Spur eines Eindrucks zeigt, sie ist vorn sehr schmal, weniger als halb so breit wie der Querdurchmesser eines Auges. Das Epistom ist deutlich etwas länger als die Stirn vorn und von ihr durch eine gebogene, stark eingedrückte Linie abgesetzt.

Am Innenwinkel der Augen zeigt sich eine sehr feine aber scharfe Augenfurche hart am Augenrand. Die Ecken des Epistoms sind breit verrundet, die Punktierung ist ausserordentlich fein, wenig dicht, regelmässig. Die Fühler sind vom vierten Gliede an gesägt, dieses ist etwas länger als breit, innen nicht scharfecking, die andern Glieder sind scharf dreieckig, so breit wie lang.

Der Halsschild ist kaum doppelt so breit wie in der Mittellinie lang, die Spitze ist ganz leicht ausgeschnitten, die Ecken treten undeutlich, ganz gerundet vor, die grösste Breite liegt bei den Hinterecken, zuerst sind die Seiten schwach verengt, von der Mitte an stark. Die Wölbung ist stark, die basalen Eindrücke sind tief, länglich. Die Punktierung ist sehr fein, weitläufig.

Die sehr breiten Flügeldecken sind flach gewölbt, die Seiten fallen recht schräge ab, daher ist die Seitenrandkante breit sichtbar. Die Färbung ist, wie oben beschrieben, wenig auffällig, die irisierenden Ränder der Flecken sind sehr schmal, die Flecken gross. Die Zwischenräume sind ganz flach, nur an der Spitze sind einige Streifen, besonders der Nahtstreif, mehr vertieft. Bei flüchtiger Betrachtung erscheinen die Punktstreifen als eingeschnittene Linien, da die Punkte so dicht stehen (über 100 im vierten Streifen) dass sie vertieft zu sein scheinen. Die äusserst feine und weitläufige Punktierung der Zwischenräume ist nur bei starker Vergrösserung sichtbar. Die Spitzen sind gemeinsam verrundet, die äusserste Ecke ist im Nahtstreif leicht längsverdickt.

Das Prosternum ist wagerecht, zwischen den Hüften undeutlich gefurcht, vorn kaum gesenkt und scharfeckig über dem Hals erhaben. Die Mittelbrust ist breit U-förmig ausgeschnitten, die Ecken sind verrundet. Das Abdomen ist deutlich längsstrigos, das Analsegment an der Spitze schwach ausgerandet und angedrückt. Die Beine sind lang und sehr plump. Die Schenkel sind beim Männchen nicht deutlich gekrümmt, die Vorderschienen sind geknickt, in der Endhälfte verbreitert und dort mit 3 oder 4 Körnern versehen. Die Mittelschienen sind innen schon vor der Mitte gebogen, dann verbreitert, und in der Verbreiterung an der Vorderseite mit feiner Kante versehen, aber nicht deutlich tuberkuliert. Auch die geraden Hinterschienen sind verhältnismässig plump, gegen das Ende schwach dicker werdend, sie haben aussen an der Spitze einen flachen Eindruck in welchen die aufwärts geschlagene Tarse passt. Die Vorderfüsse sind kräftig verbreitert.

Länge, 11.9 bis 12.3 Millimeter; Breite, 6.2.

Zwei Weibchen von Sumatra, Medan; in meiner Sammlung.

Diese grosse, breite Art hat einen näheren Verwandten in *C. opulenta*, die aber viel schöner gefärbt ist, nur das Pronotum ist bei unserer Art ähnlich bunt, die Punkte der Streifen stehen sehr dicht (bei *opulenta* nur circa 60 Punkte im vierten Streif) an den dicken Hinterschienen der Männchen findet sich ein Eindruck, der bei Harold's Art fehlt. Der Eindruck findet sich nur bei wenigen Arten. Ich finde ihn bei *C. formosana, sulcifrons, decolorata, amplipennis, pyritosa*, und *medanensis*. Am nächsten steht unsere Art der *C. formosana*, bei welcher ebenfalls die Punkte der Streifen sehr dicht stehen, aber die Art von Formosa ist sehr lebhalt gefärbt, der Halsschild dagegen düster, die Zwischenräume sind kräftig gewölbt, die Stirn ist gefurcht, die Fühlerglieder sind deutlich quer.

Ceropria medanensis sp. nov.

Breit oval, Hinterkörper gewölbt, die Seiten fallen nicht senkrecht ab, die Unterseite ist bis auf die meist deutlich metallischen Epipleuren schwarz, die ganze Oberseite bunt. Kopf kräftig metallisch, meist goldig, Halsschild leuchtend purpurblau oder violett oder purpurn, Flügeldecken ohne bunte Makeln an Schultern und Spitze, goldig braun erzfarben, die Punktstreifen meist sehr schmal purpurn, der Rand sehr schmal, aber gut abgehoben blau.

Der Kopf hat auf der Stirn keinen Eindruck, diese ist vorn sehr schmal, nicht breiter als das dritte Fühlerglied lang, schmäler als der Vorderkopf vor den Augen, von ihm durch eine scharfe, eingedrückte Furche abgesetzt. Die Punktierung ist sehr fein, hinten auf der Stirn kaum deutlicher. Die Fühler sind vom vierten Gliede an gesägt, beim Weibchen ist das vierte Glied ebenfalls deutlich quer, die folgenden stärker, scharf dreieckig, beim Männchen ist Glied 4 so breit wie lang, die folgenden nicht so stark quer.

Der Halsschild ist doppelt so breit wie lang, die Basaleindrücke sind kräftig, die Punktierung ist zwar sehr fein, aber doch deutlich und ziemlich gleichmässig, die Verengung geschieht schon von der Basis an, ist aber zuerst unauffällig, die Vorderecken sind ganz verrundet und treten von oben gesehen schwach vor.

Auf den Flügeldecken fehlen die queren Flecken oder farbigen Binden. Der Rand ist von oben breit sichtbar. Die Zwischenräume sind vollkommen flach und nur bei starker Vergrösserung sichtbar punktiert. Die Linien haben dicht gedrängt stehende

Punkte (über 100 im vierten Streif), die so dicht stehen dass scheinbar eingeschnittene Linien vorhanden sind. Unterseite und Beine wie bei voriger Art.

Länge, 11 bis 12 Millimeter; Breite, 6.1 bis 6.3.

Zwei Männchen und 3 Weibchen in meiner Sammlung; ein weiteres Männchen in der Sammlung Veth.

Sumatra. Medan; Padang Pandjang; Manna (*Knappert*).

Diese Art stimmt in allen wesentlichen Merkmalen mit *C. amplipennis* überein, ist aber sofort durch die Färbung zu unterscheiden. Einfarbig metallische Flügeldecken sind in der Gattung sehr selten, sie finden sich ausser bei unserer Art bei *C. erythrocnema* und *caesarea*. Die erstere gehört aber einer ganz andern Gruppe an, ausgezeichnet durch die eigentümliche Bildung des männlichen Abdomens, breite gefurchte Stirn, rote Schenkel, nicht scharf gesägte Fühler. Die *C. caesarea* hat starke Schulterbeulen, in Schwänzchen ausgezogene Deckenspitzen, goldig gefleckten Halsschild. *Ceropria amplipennis*, die nächst verwandte Art, hat nicht nur ganz andere Färbung, sondern auch etwas breitere Stirn und nicht quere Fühlerglieder.

Ceropria pyritosa sp. nov.

Gross, breit, und ziemlich flach; Vorderkörper dunkelblau, der Halsschild in der Mitte zuweilen mit einigen undeutlichen Purpurflecken; Flügeldecken herrlich goldig und feuerrot, Naht blaugrün, Schulter und Spitze prachtvoll feurig goldig, doch fehlen irisierende Ränder der Flecke.

Der Kopf ist breit, die Stirn von vorn nach hinten gleichmässig gewölbt, ohne Spur eines Eindrucks, Augenfalten fehlen. Die Breite der Stirn vorn ist geringer als die halbe Breite eines Auges, die Wangen sind kräftig aufgebogen. Die Fühler sind vom vierten Gliede an scharf gesägt, beim Männchen sind die Glieder so breit wie lang, beim Weibchen quer.

Der Halsschild ist an der Basis doppelt so breit wie in der Mittellinie lang, die Seiten sind in der Endhälfte parallel, die Hinterecken scharf stumpfwinklig, die vorderen verrundet und schwach vorragend. Die Spitzenrandung ist sehr fein und vollständig, die basalen Grübchen sind stark. Die Punktierung ist ausserordentlich fein; dem schwach bewaffneten Auge erscheint die Oberfläche glatt.

Die Flügeldecken haben kräftige Schulterbeulen, sie sind hinter der Mitte am breitesten; der Seitenrand ist von oben ganz sichtbar. Vor der Mitte findet sich über dem Seitenrand, die beiden äusseren Zwischenräume einnehmend, ein flaches Grüb-

chen. Die Spitzen sind in beiden Geschlechtern normal. Die oben beschriebene Färbung ist nicht abgegrenzt, es fehlen auch irisierende Querlinien. Die Punktlinien sind sehr oberflächlich und zart, nicht eingeschnitten, die Punkte stehen sehr dicht, circa 100 im vierten Streifen. Die kaum sichtbar punktierten Zwischenräume sind vollkommen flach.

Das Prosternum ist nach vorn schwach und gleichmässig gesenkt, stumpf gekielt, zwischen den Hüften fein doppelfurchig, die Propleuren sind glatt. Das Mesosternum ist breit U-förmig ausgeschnitten, das Metasternum der Länge nach flach gefurcht. Die beiden vorletzten Abdominalsegmente sind beim Männchen normal breit; das Analsegment ist in diesem Geschlecht mit flacher, grosser Grube versehen, beim Weibchen mit undeutlichem Eindruck. Die Beine sind ganz schwarz. Die Vorder- und Mittelschienen des Männchens sind geknickt, die vorderen in der Mitte mit leichtem und sehr langem Ausschnitt versehen, darunter mit einigen feinen Körnchen an der Innenseite. Die Mittelschienen haben in der Mitte einen Ausschnitt von etwa einem Viertelkreisbogen (bei Ansicht schräg von hinten deutlich!), am etwas verbreiterten Ende fehlen aber Körnchen. Die Hinterschienen haben beim Männchen an der Oberseite des Endes einen sehr deutlichen Eindruck. Die Vordertarsen sind mässig stark verbreitert, die mittleren nicht; an den Hintertarsen ist Glied 1 deutlich kürzer als der Rest.

Länge, 9.3 bis 11.1 Millimeter; Breite, 5 bis 5.8.

Ein Männchen und 3 Weibchen von den Philippinen. Mindanao, Iligan, und von derselben Insel, Kolambugan (*Baker*).

Diese herrliche Art hat flüchtige Aehnlichkeit mit der auf den Philippinen häufigen Unterart *subocellata* von *induta*, ist aber viel schöner gefärbt, ihr fehlen die irisierenden Ränder an Schulter und Spitze, Kopf und Halsschild sind stark blau; an den Seiten der Decken findet sich vor der Mitte ein rundlicher Eindruck, die Fühlerglieder sind scharf dreieckig, und das Männchen hat den charakteristischen Eindruck am Ende der Hinterschienen. Dieses letztere Merkmal kommt nur einer kleinen Gruppe von Arten zu: der obigen Art, *sulcifrons*, *formosana*, *amplipennis*, *decolorata*, und *medanensis*, von denen aber die vier ersteren Arten irisierende Binden haben; ausserdem haben *sulcifrons* und *formosana* eine Stirngrube, *amplipennis* hat fein eingeschnittene Punktlinien und keine Gruben an den Seiten der Decken, *decolorata* hat nicht nur andere Färbung, sondern auch grobe, weitläufige Punkte der Decken. *Ceropria medanensis* scheint unserer Art am nächsten zu stehen, ist aber viel düsterer

gefärbt, hat fein eingeschnittene Punktlinien und keine Grübchen an den Seiten der Decken.

Ceropria mindanaica sp. nov. Tafel 1, Fig. 6.

Sehr breit, Oberseite sehr bunt, herrlich gefärbt, Kopf blaugrün, Halsschild leuchtend goldig, an den Seiten feurig rot, Flügeldecken mit irisierenden Kreisen um die rotkupfrigen Schulter- und Spitzenflecken.

Kopf breit, Stirn ohne Grube, vorn zwischen den Augen schmäler als das Epistom von der Querfurche bis zum Vorderrand breit, so breit wie Glied 2 und 3 der Fühler zusammen lang. Die Querfurche ist sehr tief. Fühler stark gesägt, Glied 4 länger als breit, vom fünften an sind die Glieder scharf dreieckig, so breit wie lang, das letzte hat an der Vorderkante einen stumpfen Winkel, entsprechend der Spitze der andern Glieder. Die Punktierung ist äusserst fein, besonders auf dem Epistom.

Der Halsschild ist über doppelt so breit wie in der Mittellinie lang; die grösste Breite liegt in der Mitte, nach hinten hin sind die Seiten schwach aber deutlich verengt; die Verengung nach vorn ist sehr stark, die basalen Grübchen sind tief. Die Vorderecken ragen kurz lappenförmig vor. Die Färbung ist herrlich goldig, an den Seiten feurig kupfrig, die Punktierung scharf, aber sehr fein.

Die Flügeldecken sind nach dem Schema von *induta* und *opulenta* gefärbt, aber viel schöner als bei der ersteren. Schulter und Spitze sind dunkel rotkupfrig, die Naht ist golden. Die zwischen den beiden Flecken entstehende Binde ist viel schmäler als bei *induta,* leuchtend kupfrig rot. Der Seitenrand der Decken ist von oben breit sichtbar, die grösste Breite liegt im letzten Drittel. Die Linien von Punkten sind fein, einfach, nicht eingedrückt, die Punkte mässig gross, circa 65 stehen im vierten Streifen, verlieren sich aber an der Spitze. Die Zwischenräume sind vollkommen flach, nur direkt an der Spitze kräftig gewölbt, die Spitze selbst ist einfach.

Die Unterseite ist nackt, das Prosternum ist von den Hüften an wagerecht, nur fein rauh, vorn stark abschüssig und dem Hals eckig aufliegend, die Spitze ist prononziert. Das Mesosternum ist gerundet tief eingedrückt, seine Ecken sind nicht scharf. Das Abdomen ist am Ende abgeschnitten und kräftig, aber nicht scharfkantig eingedrückt. Die Schenkel sind schwarz, die Vorderschienen des Männchens sind stark geknickt, in der Mitte mit kräftigem bogigen Ausschnitt versehen, darunter scharf tuberkuliert. Die Mittelschienen sind schwächer geknickt, leicht ausgeschnitten, unter dem Ausschnitt mit fein krenulierter

Kante versehen, innen am Ende mit scharfer Ecke. Die Vordertarsen der Männchen sind stark verbreitert, die Hinterschienen haben in diesem Geschlecht am Ende keinen Eindruck. An den Hintertarsen ist Glied 1 etwas kürzer als der Rest.

Länge, 10.6 Millimeter; Breite, 5.7.

Ein Männchen von den Philippinen, Mindanao, Iligan (*Baker*).

Diese wundervoll gefärbte Art übertrifft noch die *C. opulenta* Harold, neben welche sie zu stellen ist, sie ist aber etwas grösser, breiter, der Halsschild ist nicht an den Hinterecken, sondern in der Mitte am breitesten, der Kopf ist blau, die Stirn des Männchens etwas breiter. Die Punkte der Streifen sind zwar nicht zahlreicher, aber kleiner und an der Spitze fast erloschen, dort sind auch die Zwischenräume gewölbt, bei *opulenta* dagegen fast flach. Die Vorderschienen des Männchens sind stark geknickt und in der Mitte ausgerandet, bei Harold's Art dagegen mit schwachem Ausschnitt versehen und schwach geknickt. Ferner ist das Analsegment am Ende abgestutzt und eingedrückt, bei *opulenta* dagegen einfach.

Ceropria laticollis Fairmaire.

Ceropria laticollis FAIRMAIRE, Ann. Soc. Ent. Belg. 47 (1903) 13.

Diese Art hat Fruhstorfer in grosser Zahl aus Tonkin und Annam mitgebracht. Von ihm hat sie der Autor erhalten, und aus derselben Quelle ist sie in viele Sammlungen gekommen (zum Beispiel, Berlin, München, und Gebien).

Fairmaire gibt zwar an anderen Ort eine ausführliche Beschreibung, doch fehlt gerade das Merkmal das sie sicher von *C. induta* respektiv *subocellata* scheidet; das ist die Bildung der Beine beim Männchen. Während nämlich bei *induta* und seiner Unterart die Vorder- und Mittelschienen geknickt und kräftig tuberkuliert sind, sind sie bei *laticollis* fast gerade und haben nur Spuren von Körnern an der Innenkante, auch sind die Schienen, besonders die mittleren, wesentlich dicker. Die Zwischenräume der Decken sind fast immer ganz flach und nur bei einigen Stücken meiner Sammlung von Sikkim deutlich gewölbt. Die Art gehört zu den grösseren der Gattung (10.5 bis 13.5 Millimeter) und ist breit oval.

Tonkin, Mount Mauson, April-Mai, 2,000 bis 3,000 Fuss (*Fruhstorfer*). Annam, Pha-Rang; Phuc-Son, November-Dezember (*Fruhstorfer*). Sikkim, Abor-Land, Rotung, 1,400 Fuss, 23ter Dezember, 1911 (*Kemp*). Burma, Carin Ghecu, 1,300

bis 1,400 Meter, Februar-März, 1888 (*Fea*); Carin Chebà, Mai-Dezember, 1888, 900 bis 1,100 Meter (*Fea*).

Ceropria laticollis Fairmaire subsp. **schenklingi** Gebien.

Ceropria laticollis Fairmaire subsp. *schenklingi* GEBIEN, Arch. Naturg. 79 1913 (1914) Abt. A, Heft 9, 19.

Diese Form steht in einem ähnlichen Verhältnis zu *laticollis* wie *purpurina* zu *induta*. Auf Formosa scheint nur *schenklingi*, aber nicht die Stammart vorzukommen. Sonst liegt mir nur ein Exemplar der Form von Abor-Land, Puging, 3,000 Fuss, Februar, 1912 (*Kemp*) vor.

Bei *schenklingi* sind die Flügeldecken einfarbig violett. Die wesentlich breiteren Vordertarsen der Männchen berechtigen aber vielleicht doch diese Form als eigene Art aufzufassen.

Ceropria induta Wiedemann.

Ceropria induta WIEDEMANN, Germ. Mag. Ent. (1821) 164; CASTELNAU und BRULLÉ, Ann. Sc. Natur. (1829) 399; HAROLD, Stett. Ent. Zeitg. 38 (1877) 351.

Dieses ist die gemeinste indo-malayische Art, in allen Sammlungen vorhanden, und sehr weit verbreitet; mir liegen gegenwärtig über 300 Exemplare vor. Zugleich ist diese Art auch leider ziemlich veränderlich und am schwersten gegen nahe verwandte Arten abzugrenzen (*dolorosa, subocellata, mindorense, laticollis*). Ich habe vergeblich versucht *induta* von *subocellata* scharf zu trennen. Obgleich mir ein reiches Material (darunter das von Harold bearbeitete und die Typen von Wiedemann, die ehemalige Sammlung Haag), ferner die einschlüssige Litteratur vollständig zur Verfügung steht, ist es mir nicht gelungen die beiden, bisher als gut getrennt angesehenen Formen, artlich zu trennen. Das Resultat meiner Untersuchungen ist folgendes:

1. Wiedemann hat offenbar beide Arten bei der Abfassung der Beschreibung vor sich gehabt. Die Typen seiner eigenen Sammlung im Museum Hamburg gehören der Form an welche Harold, und offenbar auch Castelnau und Brullé, als *subocellata* aufführen. Ein weiteres Exemplar des Berliner Museums, ebenfalls mit der Bezeichnung "type" versehen (ex Coll. Westermann), is die "echte" *induta* der Autoren. Da also Wiedemann eine Mischart aufstellte, liegt kein Grund vor die gangbare Nomenklatur zu ändern.

2. Castelnau und Brullé haben, wie schon Harold ausführt, unter *induta* Wiedemann möglicherweise irgend eine andere Art

verstanden. Aber ihre Beschreibung widerspricht doch nicht geradzu der Deutung auf *induta* Wiedemann im Sinne Harold's.

3. Harold bezeichnet im Museum Berlin eine Anzahl Exemplare von Java als *subocellata,* Tiere die sich durch etwas breiteren Körper, bedeutendere Grösse, ganz flache Zwischenräume mit deutlicher Punktierung von *induta* typ. unterscheiden. Auf diese Stücke passt tatsächlich die Beschreibung von Castelnau und Brullé. Ich habe also keinen Grund an dem Resultat der Untersuchungen Harold's etwas zu ändern.

4. Lewis [4] gibt ebenfalls eine Auffassung der *induta* im Gegensatz zu *subocellata.* Aber während Harold die Unterschiede zwischen beiden Arten in Grösse und Skulptur der Decken sucht, findet Lewis ausser in Gestalt und Grösse den wichtigsten Unterschied in der Bildung der männlichen Tarsen und Schienen. Er sagt die Vordertarsen seien kaum erweitert und die Vorder- und Mittelschienen kaum "dentate," ich würde sagen "gekörnt." Aus diesen Angaben und der Bemerkung über die Grösse scheint mir hervorzugehen dass Lewis nicht die *subocellata* der andern Autoren vor sich hatte, sondern eine andere Art. Leider liegt mir sein Material nicht vor, aber seine Angabe, dass er die Art aus der Sammlung Bates von vielen Fundorten vor sich hatte, beweist dass es sich nicht um eine rein japanische Form handeln kann, sondern um eine weiter verbreitete. Ich bin der Meinung dass er Tiere der Art vor sich hatte welche Fairmaire später als *C. laticollis* von Tonkin beschrieb. Leider liess ich mich bei der Bearbeitung der Formosafauna durch Lewis verleiten *laticollis* als *subocellata* aufzufassen, muss aber jetzt meine Meinung ändern.

5. Meine Auffassung: Mir liegt von Java, dem Originalfundort sowohl von *induta* als auch von *subocellata,* ein reiches Material aus den verschiedensten Sammlungen vor. Es zeigt sich dass beide Formen nicht artlich getrennt werden können. Grössere, breitere Tiere, mit flachen, kräftig punktierten Zwischenräumen, eben die *subocellata* der Autoren, zeigen in allen den genannten Merkmalen Uebergänge zu *induta.* Die Form wird allmählich schmäler, die Zwischenräume nach und nach gewölbter, und deren Punktierung wechselt sehr, ist oft sehr deutlich bei gewölbten Zwischenräumen und dann wieder sehr fein bei flachen, ebenso umgekehrt. Aehnliche Beobachtungen mache ich an dem Material von den Philippinen. Dagegen würde ich die weit über

[4] Ann. & Mag. Nat. Hist. VI 13 (1894) 399.

100 Exemplare von Formosa, die ich gegenwärtig in Händen habe, sämtlich zu *induta* im engeren Sinne stellen, sie zeigen alle die schmale Form, geringe Grösse, die geknickten, deutlich tuberkulierten Mittelschienen der Männchen; aber auch bei diesen Tieren wechselt die Wölbung der Interstitien und deren Punktierung. Wie schwer die Frage zu entscheiden ist mag daraus hervorgehen, dass Harold ein Paar Tiere aus der Sammlung Haag, die von seinen Berliner Exemplaren der *subocellata* garnicht zu unterscheiden sind, zu *induta* stellt; und umgekehrt steckt dort ein Tier bei *subocellata,* das sicher besser bei *induta* aufgehoben wäre.

Ich meine also die beiden Formen sind artlich nicht zu trennen. Man mag *subocellata* als Rasse der *induta* auffassen, gekennzeichnet durch ovalen Körperumriss und kräftige Punktierung der flachen Zwischenräume. Auch die Untersuchung der Genitalien bewies die Uebereinstimmung.

Die Art ist ungemein weit verbreitet.

FUNDORTE FÜR DIE STAMMFORM

Da ich nicht weiss ob alle Verfasser die inbetracht kommenden Formen richtig getrennt haben, gebe ich nur die Fundorte der Stücke die mir gegenwärtig vorliegen:

Ceylon (*Nietner*); Nalanda (*Horn*); Putalam (*Horn*); Maskebjea (*Horn*); Anaradhapura (*Horn*). Andamanen (*Roepstorff*). Burma, Amherst Distrikt, Kawgareik, 19ten November, 1911 (*Graveley*); Bhamo, Juli, 1886 (*Fea*); Pegu, August bis Dezember, 1887 (*Fea*); Shwegoo Myo, Oktober, 1885 (*Fea*); Catcin Cauri, August bis November, 1886 (*Fea*); Carin Chebà, 900 bis 1,100 Meter, Mai, 1888 (*Fea*); Palu (Pegu), August bis September, 1887 (*Fea*). Malacca, Perak (*Grubauer*); Tenasserim, Malewoon, Juli bis August, 1887 (*Fea*); Loeb Alai (*Grubauer*); Lialang (*Grubauer*); Singapore. Annam, Phuc-Son, November bis Dezember (*Fruhstorfer*). Insel Hainan, 10ten bis 25ten März, 1909 (*Schoede*). Insel Formosa, in grosser Zahl von zahlreichen Fundorten (*Sauter*). Japan, Nagasaki (*Hilgendorf*). Die Stücke stecken im Museum Berlin unter den Typen von *C. sulcifrons.* Sumatra, Ajer Mantcior, August, 1878 (*Beccari*); Sungei-Bulu, September, 1878 (*Beccari*); Padang, März, 1886 (*Modigliani*); Tebing-tinggi, 15ten bis 17ten August, 1884; 8ten, 11ten, 20ten Oktober, 1884; 2te Januar, 1885 (*Schultheiss*); Peinan (*v. Faber*); Residentschaft Palembang (*Knappert*); Soekaranda (*Dohrn.*) Insel Nias, Gun.-Sitoli, April, 1886 (*Modigliani*). Insel Engano, Bua Bua, Mai bis Juni, 1891 (*Modigliani*);

Kisa-juc, Mai, 1891 (*Modigliani*). Insel Simalur, Pulu Babi, April, 1913 (*Jacobson*). Java, Palabuan Ratu (*Axel Preyer*); Tengger Gebirge, 4,000 Fuss (*Fruhstorfer*); Soekaboemi 2,000 Fuss (*Fruhstorfer*); Buitenzorg, 24ten Februar bis 12ten März, 1904 (*Kraepelin*); Depok (*Nierstrass*). Borneo, Insel Banguey (*Kedenburg*); Sarawak (*Doria*); R. Limbang, 4ten April, 1910 (*Moulton*); Kinabalu (*Waterstradt*); Tandjong (*Suck.*), Sandakan (*Baker*). Philippinen, Insel Luzon, Los Baños (*Baker*); Mount Maquiling (*Baker*). Insel Mindanao, Butuan (*Baker*); Dapitan (*Baker*); Iligan (*Baker*); Kolambugan (*Baker*). Insel Leyte, Tacloban (*Baker*). Insel Palawan, Puerto Princesa (*Baker*). Celebes, Toli Toli, November bis Dezember, 1895 (*Fruhstorfer*). Halmahera (ex. coll. Westermann).

UNTERART SUBOCELLATA CASTELNAU UND BRULLÉ

Sumatra, Tebing-tinggi, 11ten Oktober, 1884 (*Schultheiss*). Borneo, Sandakan (*Baker*). Java, Preanger (*Sijthoff*) meist ohne genaueren Fundort; Pengalengan, 4,000 Fuss (*Fruhstorfer*). Philippinen, Insel Mindanao, Iligan, Butuan (*Baker*); Dapitan (*Baker*); Kolambugan (*Baker*).

Ceropria induta var. **purpurina** var. nov.

Diese Form ist eine Abänderung der typischen *induta*, also schmal, mit leicht gefurchten Decken, schwach oder undeutlich punktierten Zwischenräumen, sie unterscheidet sich von *induta* durch die Färbung; die Seiten des Halsschildes sind lebbaft goldig, die Flügeldecken purpurviolett mit kleinem, blaugrünen Schulter- und Apikalfleck, seltener ist die Naht und eine Querbinde zwischen den Flecken goldig. Diese Abänderung vertritt die eigentliche *induta* in Vorderindien. Ich fand sie in den Sammlungen unter den Namen *C. speciosa* Kl., *nepalensis* Sturm, und *hoppei* Gory.

Mir liegen circa 60 Exemplare vor in den Sammlungen Berlin, Dahlem, München, Gebien, und Schuster.

Südindien, Madura, Shembaganur, Kanara (*Andrewes*); Himalaya, Kulu (*Rost.*); Darjeeling; Nepal; Ramnagar, U.P., 11ten Dezember, 1912, unter Rinde von *Salix*. Nordost Assam, Sadiya, 26ten November, 1911 (Abor Expedition, Kemp). Assam, Khasia Hills.

Ceropria opulenta Harold. Tafel 1, Fig. 7.

Ceropria opulenta HAROLD, Stett. Ent. Zeitg. 38 (1877) 354.

Harold beschränkt sich bei der Beschreibung dieser und verwandter Arten auf die genaue Angabe der Farbe. Es sind

daher einige plastische Merkmale hinzuzufügen, zumal dem Verfasser nur ein Weibchen vorlag. Ich besitze jetzt beide Geschlechter.

Die Stirn hat keinen Eindruck, sie ist beim Weibchen reichlich halb so breit wie ein Auge von oben gesehen, beim Männchen viel schmäler, das Epistom ist in diesem Geschlecht viel breiter als die Stirn vorn zwischen den Augen, beim Weibchen ebenso breit. Die Fühler sind vom vierten Gliede an gesägt, beim Männchen sind die Glieder kaum quer, beim Weibchen dagegen wesentlich breiter als lang. Der Halsschild ist beim Männchen doppelt so breit wie lang, beim Weibchen breiter. Die Färbung der Decken ist sehr lebhaft, bei den Männchen ist der Grund mehr goldig, im vierten Streifen stehen ungefähr 60 Punkte. Das Prosternum ist vorn leicht gekielt und liegt eckig über dem Hals, der Fortsatz ist nicht gerandet, die Ecken der Mittelbrust sind ziemlich scharf. Das Abdomen ist fein längsstrigos und sehr fein punktiert. Die Vorderschenkel des Männchens sind sehr kurz goldgelb beborstet, die Vorderschienen sind leicht geknickt, in der Endhälfte verbreitert, und dort innen mit vier oder fünf Körnchen versehen. Die Mittelschienen sind ebenfalls leicht geknickt, gegen das Ende schwach verbreitert und undeutlich gekörnt. Die Hinterschienen sind ziemlich dünn, beim Männchen aussen am Ende nicht mit Eindruck versehen. Die Vordertarsen sind kräftig verbreitert.

Länge, Männchen, 10.5 Millimeter; Weibchen, 9.6.

Ein Weibchen von Sumatra (Type im Berliner Museum); 1 Männchen von Medan (Type Männchen) in meiner Sammlung; ein Männchen von Sumatra. Soekaranda (*Dohrn*), im Stettiner Museum.

Ceropria caesarea sp. nov.

Sehr gross, lang oval, stark gewölbt, von der Gestalt der grossen *Eucyrtus*-Arten. Kopf, Unterseite, und Beine schwarz. Halsschild purpurviolett mit goldenen Makeln und Binden. Flügeldecken ohne Flecke und Binden, dunkel goldig braunbronzefarben, die Punktstreifen selbst schmal purpur-bläulich, Epipleuren herrlich stahlblau.

Der Kopf ist klein, die Stirn breit und kräftig längsgefurcht, die Augen sind stark quer, die Stirn vorn zwischen ihnen weniger als halb so breit wie ein Auge, kaum breiter als das dritte Fühlerglied lang, viel schmäler als das Epistom vor den Augen, die Augenfurche ist nur unter starker Vergrösserung sichtbar.

Die Punktierung ist sehr fein; die Wangen sind geradlinig und stark verengt, die Ecken des Epistoms liegen daher weiter nach innen als die Mitte der Augen hinter ihnen. Die Fühler sind stark gesägt, Glied 4 länger als 3, schon etwas quer, die folgenden sind nach innen spitz dreieckig ausgezogen, viel breiter als lang, sehr stark flach gedrückt. Das letzte Glied ist auffällig klein, etwas quer.

Der Halsschild ist auch an den Seiten gewölbt, nicht ganz doppelt so breit wie lang, die basalen Eindrücke sind rundlich, stark, dort ist die Punktierung dichter und gröber als auf der Scheibe, an den Seiten und vorn aber fast erloschen. Die Spitze erscheint fast gerade abgestutzt. Die Färbung ist charakteristisch und erinnert etwas an die von *festiva* und *versicolor*, ist aber viel schöner. Auf herrlich violettem Grunde findet sich in der Mittellinie der Vorderhälfte eine längliche Goldmakel, am Rand jederseits eine O-förmige, und hinter der Mitte eine quere, die an den Seiten mit den Randmakeln zusammenhängt und den violetten Basalrand abtrennt. Wo die violette Grundfarbe in die goldige übergeht, sind die Ränder schmal kupferrot.

Die Flügeldecken haben sehr starke Schulterbeulen, die vorn den sechsten Streif an den fünften herandrängt. Die quere Wölbung ist besonders hinten sehr stark, so dass hinter der Mitte der Seitenrand gerade noch sichtbar ist, am Rande findet sich jederseits vor der Mitte ein kräftiger Eindruck. Die Zwischenräume sind volkommen flach und zeigen nur bei sehr starker Vergrösserung sichtbare Punktierung. Die Punkte der Reihen stehen äusserst dicht (weit über 100 im vierten Streif), sind aber nicht vertieft. Die Spitze der Decken ist beim Weibchen in einen ganz kurzen Schwanz ausgezogen, dieser ist stark zusammengedrückt, so dass die Naht unmittelbar an der Spitze klafft und sich am Fortsatzende wieder zusammenschliesst.

Das Prosternum ist vorn gekielt, fällt nach vorn gerade ab, und ist zwischen den Hüften jederseits fein gefurcht; die Propleuren sind glatt, die Mittelbrust ist V-förmig ausgeschnitten, die Hinterbrust ist der Länge nach fein und stumpf gekielt, das Abdomen des Weibchens zeigt am dritten und vierten Segment eine auffällig breite Gelenkhaut und dürfte beim Männchen wie bei *versicolor* gebildet sein. Das Analsegment ist beim Weibchen nicht ausgezeichnet.

Länge, 14 Millimeter; Breite, 7.2.

Ein Weibchen von Malacca, in meiner Sammlung.

Die grösste und eine der schönsten Arten der Gattung, sie dürfte zur Gruppe *versicolor* gehören, doch kann das nur nach

Bekanntwerden des Männchens entschieden werden; sie unterscheidet sich aber durch sehr stark gesägte Fühler. Die Färbung des Halsschildes, die starken Schulterbeulen, die gekielte Hinterbrust, und die sonderbare Bildung der Flügeldeckenspitze sind in der Gattung ohne Seitenstück.

Ceropria dolorosa Fairmaire.

Ceropria dolorosa FAIRMAIRE, Notes Leyd. Mus. 5 (1883) 34.

Diese Art ist mir unbekannt geblieben. Sie ist von Saleyer beschrieben. Ich glaubte zuerst, die *C. tristis* Harold von dem benachbarten Timor auf die Art beziehen zu müssen. Aber *tristis* ist wesentlich grösser (10 bis 11 Millimeter, statt 8), glänzend schwarz, Fairmaire's Art schwarzbraun und die Flügeldecken haben flachere Interstitien als *induta*, während sie bei *tristis* tiefer gefurcht sind. Ich muss mich, da ich keines der mir vorliegenden Tiere auf *dolorosa* deuten kann, auf eine Wiedergabe der Beschreibung beschränken.

Oblongo-ovata, modice convexa, nitida, fusco-nigra, vix sensim metallescens, subtus fere opaca, tarsis antennisque obscure, piceis; capite interoculos subtiliter sat dense punctato, ante oculos utrinque sat profunde foveolato, inter antennas sulcato; antennis brevibus, art. 4–10 aequalibus, triangularibus, punctatis, 10° obtuse rotundato, prothorace elytris paulo angustiore, longitudine duplo latiore, lateribus marginalis, antice cum angulis rotundatis, margine postico utrinque late sinuato, medio recto, dorso subtilissime sat dense punctulato, basi utrinque impressione brevi, oblonga, interdum oblique signato; scutello late ogivali laevi; elytris tenuiter striatis, striis subtiliter punctatis, intervallis vix convexiusculis, obsoletissime punctulatis, subtus laevis, prosterno apice fere recte angulato, planato, utrinque tenuiter striato.

Ressemble un peu a la *C. induta* Wiedem. mais bien différente par la coloration sombre, la taille plus petit, les élytres plus courtes, à stries plus fines, plus finement ponctué avec les intervalles plus plans.

Ceropria tristis Harold.

Ceropria tristis HAROLD, Stett. Ent. Zeitg. 38 (1877) 349.

Mir liegt ausser den Typen dieser Art aus dem Berliner Museum kein weiteres Material vor. *Ceropria tristis* ist der *induta* nahe verwandt, aber etwas grösser und schmäler, glänzend schwarz und an dieser Färbung leicht zu erkennen. Die Clypealfurche ist tiefer eingeschnitten, die Vorderwinkel des Halsschildes sind breiter verrundet, Vorder- und Mittelschienen stärker geknickt, die letzteren haben in der Mitte einen viertelkreisförmigen Ausschnitt, der bei *induta* viel schwächer ist.

Im übrigen ist auf Harold's Beschreibung zu verweisen. Leider durfte ich an dem Material die Männlichen Geschlechtswerkzeuge nicht untersuchen.

Timor.

Ceropria subnigra sp. nov.

Von der Gestalt and Grösse der *induta*, glänzend schwarz mit schwachem, bläulichem Schimmer. Fühler und Beine schwarz.

Der Kopf hat hinten auf der Stirn ein punktförmiges Grübchen, er ist sehr fein punktiert. Die Stirn ist vorn zwischen den Augen so breit wie Glied 3 und 4 der Fühler lang, die Querfurche ist kräftig und schmal eingedrückt, gebogen. Die Fühler sind vom vierten Gliede an gesägt, die einzelnen Glieder aber nicht sehr scharf dreieckig, kaum quer.

Der Halsschild hat ganz die Gestalt wie der von *induta*, ist also sehr flach und gleichmässig gewölbt, einfarbig schwarz, die Vorderecken ragen aber fast garnicht mehr vor, sind breit verrundet, die Hinterecken sind scharfwinklig, fast 90° gross, die Basis ist ungerandet. Die Punktierung ist äusserst fein, die Seitenrandkehle ist nicht breiter als bei *induta*.

Die Flügeldecken sind gefurcht, die Zwischenräume besonders hinten gewölbt, aber kaum wahrnehmbar punktiert. Die Punkte der Streifen sind sehr klein und eng, bis auf die fast glatten Zwischenräume ist kein Unterschied zwischen beiden Arten vorhanden.

Das Prosternum ist vorn leicht aber deutlich gekielt, die Mittelbrust ist, von der Seite gesehen, ganz verrundet, das Abdomen beim Weibchen sehr fein, anliegend, sparsam behaart, in beiden Geschlechtern ohne weitere Auszeichnung. Die Vorderschienen des Männchens sind schmal, deutlich, wenn auch schwächer als bei *induta*, geknickt, am sehr schwach erweiterten Ende mit zwei oder drei Körnchen versehen. Die Mittelschienen sind beim Männchen nur sehr schwach gebogen, ohne Ausschnitt, und auf der Vorderseite der ganz schwachen Verbreiterung undeutlich tuberkuliert. Vordertarsen schwach verbreitert.

Länge, 10 bis 10.8 Millimeter.

Ein Männchen von Amboina im Museum München; 1 Männchen eben daher (*Felder* leg.) im Museum Berlin; 1 Weibchen von Buru in meiner Sammlung; 2 weitere, stark defekte Tiere, von denen sich nicht einmal das Geschlecht feststellen liess, ohne Fundort, im Münchener Museum.

Diese, der *C. induta* verwandte Art, unterscheidet sich von ihr nicht nur durch die Färbung, sondern besonders auch durch die etwas andere Beinbildung des Männchens und das Grübchen auf der Stirn. Die Mittelschienen sind fast gerade. Von der vorigen Art, die tiefschwarz ist, unterscheidet sie die etwas geringere Grösse, die schwächer gefurchten Decken mit deutlicher punktierten Zwischenräumen, das Grübchen auf der Stirn die wesentlich breiter als bei *tristis* ist, und die fast einfachen Mittelschienen des Männchens. *Ceropria dolorosa* muss ebenfalls ähnlich sein, ist aber braunschwarz, auch sonst zeigt die Beschreibung Abweichungen, ferner ist die Art nur 8 Millimeter gross.

Ceropria mindorensis sp. nov.

Von der Gestalt der *induta,* mattbraun, Vorderkörper zuweilen leicht glänzend, Flügeldecken manchmal mit der Spur von Metallschimmer, Tarsen, Kniee, Fühler, und Mundteile rotbraun, die Wurzel der einzelnen Fühlerglieder dunkler.

Der Kopf ist auf der Stirn ganz leicht eingedrückt, dort etwas gröber, aber doch sehr fein und eng punktiert, die Wangen sind nicht viel schmäler als die Augen. Die Stirn ist vorn recht breit, so breit wie ein Auge im Querdurchmesser und ebenso breit wie das Epistom vor ihr; die Quernaht ist leicht angedeutet. Die Fühler sind wesentlich länger als das Pronotum, die vorletzten Glieder sind auffällig lang gestreckt, die Glieder sind dreieckig, kaum quer, der Stiel ist dunkel.

Das Pronotum ist dem von *induta* gleich, doch ganz ohne Metallschimmer, die Punktierung kaum etwas dichter und deutlicher.

Die Flügeldecken sind flach, schmal, ihr Seitenrand ist von oben vollständig sichtbar. Die Punkte der Streifen stehen sehr dicht, die Zwischenräume sind fast flach, erscheinen aber bei Ansicht schräg von hinten ganz leicht und unauffällig dachförmig. Sie sind äusserst fein punktiert. Die Spitzen sind einfach. Unterseite und Beine sind kaum nennenswert anders als bei *induta.*

Länge, 9.2 bis 10 Millimeter; Breite, 4.5 bis 4.8.

Philippinen, Mindoro.

In beträchtlicher Zahl in meiner Sammlung und bei Staudinger und Bang-Haas, von dem ich die Art erwarb und dem ich sie als *dolorosa* bestimmte, unter welchem sie vermutlich in die Sammlungen verbreitet wurde. Ich selbst hielt sie zuerst

dafür.[5] Nach genauerer Durchsicht des gesamten mir vorliegenden Materiales glaube ich jedoch dass die auch geographisch weit getrennte Art von Saleyer nicht zu unserer Art gehört; *dolorosa* soll schwarz braun, glänzend sein, während unsere Art matt ist; auch sind dort die Zwischenräume ganz flach, deutlich punktiert, bei *mindorense* dagegen schwach gekielt, fast unpunktiert, überdies ist letztere kleiner, 8 Millimeter statt 9 bis 10.

Ceropria bifasciata Chevrolat.

Ceropria bifasciata CHEVROLAT, Compt. Rend. Soc. Ent. Belg. 21 (1878) CL; FAIRMAIRE, Ann. Soc. Ent. Belg. 40 (1896) 26.

Sehr schmal, flach, dunkelblau, ohne Metallglanz, Decken mit zwei roten Querbinden, Hinterbrust und Abdomen rotbraun.

Die Stirn ist in beiden Geschlechtern in der Längsrichtung leicht gewölbt und hat einen sehr seichten, mittleren Längseindruck, sie ist vorn kaum breiter als ein Auge im Querdurchmesser, aber deutlich breiter als das Epistom vor den Augen. Vor jedem Auge befindet sich ein kräftiger Eindruck, die Punktierung ist fein, aber sehr deutlich, besonders in der Längsfurche. Die Fühler überragen mit den letzten Gliedern die Basis des Pronotums und sind beim Weibchen etwas kürzer, die Glieder sind vom sechsten an scharf dreieckig, die vorhergehenden schwächer nach innen erweitert, die Glieder sind so lang wie breit, das letzte ist oval, Glied 3 ist kaum länger als 4, aber stark gestreckt.

Der Halsschild ist an der Basis reichlich doppelt so breit wie in der Mittellinie lang, kräftig gewölbt, die Basalgrübchen sind sehr deutlich, aber nicht tief, die hinteren $\frac{3}{5}$ des Pronotums sind parallelseitig, die Hinterecken scharf rechtwinklig, die Spitze erscheint von oben gesehen fast gerade abgeschnitten, die breit verrundeten Vorderecken ragen kaum vor, die Punktierung ist sehr fein und ziemlich dicht.

Die Flügeldecken sind lang gestreckt, oben flach, aber mit fast senkrecht abfallenden Seiten. Es gehen zwei Binden über die Decken; die vordere vor der Mitte ist so breit oder sehr wenig schmäler als der dunkle Raum an der Basis vor ihr, sie lässt den Randstreifen frei, geht aber über die Naht hinaus, sich dort nach hinten ziemlich spitz verbreiternd, sie sendet im vierten Zwischenraum einen kleinen, rundlichen Ast nach

[5] Philip. Journ. Sci. § D 8 (1913) 385.

vorn. Die hintere Binde lässt den Nahtstreif und die beiden äusseren Streifen frei, sie ist schwach länglich und von der Naht etwas schräg nach aussen und hinten gerichtet. Die Punktreihen sind kaum vertieft, die Punkte kräftig und nicht sehr dicht, im vierten Streif stehen etwa 40 Punkte. Die Zwischenräume sind auf der Scheibe flach, sehr fein, aber deutlich und dicht punktiert, die äusseren hängen ganz leicht nach aussen über, sie erscheinen daher aussen, in der Nachbarschaft des jeweiligen nächsten Streifens etwas rippenförmig. Die Spitzen sind gemeinsam verrundet, von der Seite gesehen bei beiden Geschlechtern nicht heruntergezogen.

Das Prosternum ist vorn nicht gekielt, der Fortsatz ist schmal, wagerecht, querüber stark gewölbt, die Ecken des Mesosternums sind ganz verrundet, die Pleuren und die Episternen der Hinterbrust sind unpunktiert, das Abdomen ist fein punktiert, beim Männchen normal. Die Schenkel sind dick, fast gekeult, die mittleren deutlich gekrümmt, alle kräftig und wenig eng punktiert. Die Vorderschienen sind beim Männchen leicht gekrümmt, aussen der Länge nach fein gekielt, die Mittelschienen sind stark gekrümmt, fast geknickt, in der Endhälfte verbreitert, kaum tuberkuliert, die hinteren gerade, die beiden letzten Paare ungekielt. Die Vordertarsen des Männchens sind leicht erweitert, die Behaarung der Sohlen der Hintertarsen ist zweizeilig.

Länge, 8.5 bis 9.2 Millimeter; Breite, 4 bis 4.2.

Zwei Pärchen in meiner Sammlung; 1 Männchen im Museum Dahlem.

India Oriental, Kanara, Madura, Shembaganur.

Mit dieser Art beginnt eine kleine Reihe von Arten mit roten Querbinden auf den Flügeldecken. Von den andern so gezeichneten Arten ist diese sofort an den blauen Flügeldecken zu erkennen, auf denen die vordere Binde über beide Decken herübergeht, also nicht durch die Naht unterbrochen ist.

Ceropria serripes sp. nov.

Schmal oval, flach, Unterseite und Beine rotbraun, Halsschild schwarzbraun, Flügeldecken fast schwärzlich mit schwachem, bläulichen Schein, Zeichnungen auf ihnen gelb.

Der Kopf ist in der Längsrichtung fast flach, die Clypealsutur daher kaum eingedrückt, die Stirn ist vorn zwischen den Augen wesentlich breiter als das dritte Fuhlerglied lang, aber etwas schmäler als ein Auge von oben gesehen, auf der Stirn befindet sich eine kräftige, rundliche Grube. Das Epistom ist so lang

wie der Raum zwischen den Augen, vor diesen kräftig eingedrückt. Die Punktierung ist sehr fein; die Fühler sind mässig lang, Glied 3 ist über doppelt so lang wie an der Spitze dick, 4 und 5 sind etwas rundlich, die folgenden mehr dreieckig, so breit wie lang.

Der Halsschild ist nicht ganz doppelt so breit wie in der Mittellinie lang, in der Endhälfte parallelseitig, die basalen Eindrücke sind sehr tief, ausserdem finden sich nach innen davor zwei weitere schwächere Eindrücke, die aber vielleicht individuell sind. Der Vorderrand ist, von oben gesehen, fast gerade abgestutzt, die Punktierung ist sehr deutlich, aber fein, wenig eng, regelmässig.

Die schmalen Flügeldecken sind oben depress, in der Mitte auf längere Strecke fast parallelseitig. Die Zeichnung ist charakteristisch: es findet sich eine vordere, gelbe Binde, die weit nach vorn gerückt ist, so dass der Raum vor ihr schmäler ist als sie, sie erreicht den Seitenrand, lässt aber die Naht frei, im fünften Zwischenraun sendet sie einen Ast nach vorn bis zur Basis, der einen kleinen schwarzen Humeralfleck und eine quere, gemeinsame Skutellarbinde absondert, der Hinterrand der gelben Binde ist leicht gezackt. Vor der Spitze befindet sich ein länglicher, beiden Decken gemeinsamer Fleck, der auf dem ersten und zweiten Streif entlang läuft. Die Zwischenräume sind innen ziemlich flach, nach hinten und aussen aber stark gewölbt, die Wölbung hängt nach aussen nicht deutlich über, die Punktierung ist sehr fein, die Spitzen sind gemeinsam verrundet. Die in den Streifen stehenden Punkte sind mässig dicht, im vierten stehen circa 40 Punkte.

Die Unterseite ist rot, das Prosternum wagerecht, schmal, ungefurcht, vorn nicht gekielt, Pro- und Epipleuren sind glatt, die Episternen der Hinterbrust sind deutlich punktiert. Die Punkte des Abdomens sind ziemlich weitläufig, aber ungewöhnlich stark, männliche Auszeichnungen fehlen. Die Schenkel sind kräftig, die mittleren und hinteren auf der Unterkante deutlich gekrümmt. Die Vorderschienen des Männchens sind gerade, die mittleren dünn, gerade, nur mit nach innen kräftig gekrümmter Spitze und auf der Innenseite mit circa vier scharfen Zähnen versehen. Die Hinterschienen sind leicht gekrümmt und gegen das Ende schwach verdickt. Die Vordertarsen sind im männlichen Geschlecht nur schwach verbreitert, die hinteren sehr zart, unten 2-zeilig behaart.

Länge, 7.8 Millimeter; Breite, 3.3.

Ein Männchen von Tenasserim. Plapoo, April, 1887 (*Fea*) im Museum Dahlem.

Eine ausgezeichnete Art; an der Zeichnung der Decken und den scharf gesägten Mittelschienen der Männchen leicht kenntlich. Von der vorigen Art durch diese Merkmale, die schwarze Oberseite mit dunkelbraunen Halsschild, und die gefurchten Decken gut geschieden. Vielleicht ist die folgende Art das Weibchen von *serripes*.

Ceropria vidua sp. nov.

Die Beschreibung der vorigen Art passt auf unsere, so dass es nur einiger Ergänzungen bedarf. Die Fühlerglieder sind stark quer, fast doppelt so breit wie lang; statt der runden, kräftigen Grube auf der Stirn findet sich nur ein sehr undeutlicher Längseindruck, die ersten Zwischenräume sind auch hinten ganz flach, sie sind fein, aber sehr deutlich punktiert, die Punktierung ist bei 10-facher Vergrösserung gut zu sehen, bei der vorigen Art nicht. Der hintere Fleck ist ebenfalls beiden Decken gemeinsam, aber quer und schräg von vorn nach der Naht hinlaufend, die Naht selbst läuft also tief in den Fleck hinein.

Länge, 7.5 Millimeter; Breite, 3.6.

Ein Weibchen von der Arraianküste, in meiner Sammlung.

Die nachfolgenden als Ceroprien beschriebenen Arten sind mir unbekannt geblieben. Ich konnte sie daher nur zum Teil in der Tabelle unterbringen. Eine Zusammenstellung der Beschreibungen dürfte aber wünschenswert sein.

Ceropria rufofasciata Fairmaire.

Ceropria rufofasciata FAIRMAIRE, Notes Leyd. Mus. 15 (1893) 22.

Long. 10 mm.—Ovato, modice convexa, nigrofusca, nitida, elytris utrinque fasciis 2 rufis ornatis, suturam haud attingentibus, 1ª ante medium transversa, valde dentata, 2ª fere apicali, paulo obliqua; capite subtiliter punctulato, inter oculos impresso, antice transversim sulcatulo et utrinque impresso, oculis valde transversis, antice approximatis, antennis elongatis, fuscis, opacis, apicem versus paulo latioribus, articulis 6–10 fere triangularibus, 9° et 10° latioribus et brevioribus; prothorace elytris haud angustiore, longitudine duplo latiore, antice angustato, lateribus sat rotundatis, dorso subtiliter sat dense punctato, basi biimpresso et medio rotundatim paulo lobato; scutello valde obtuso; elytris ovatis, basi truncatis, subtiliter substriato-punctatis, intervallis planis, subtilissime sat dense punctulatis; subtus cum pedibus fuscus, nitidus, vage aenescens, abdomine lateribus, medio obsolete striolato, prosterno apice compresso, acuto, mesosterno antice acute excavato.

Hab. Borneo (S. Müller).—Un seul exemplaire du Museè de Leide.

Ressemble beaucoup à la *Ceropria bifasciata* Chevr., de Bombay, mais cette dernière est bien plus oblongue, plus parallèle, avec le corselet moins

court, moins impressionné à la base, les èlytres bien plus fortement striées-ponctuées, a intervalles moins plans, à bande antérieure, transversant les élytres, à peine dentée, et les antennes plus courtes, à articles 4–10 transversaux.

Ceropria bifoveata Fairmaire.

Ceropria bifoveata FAIRMAIRE, Notes Leyd. Mus. 15 (1893) 21.

Long. 12 mill.—Ovato-elliptica, parum convexa, valde nitida, viridi-aeneo-coerulescens, prothorace maculatum purpureo-micante, elytris aeneo-coerulescenti et purpureo fere tesselatis; capite sat brevi, fere indistincte punctulato, oculis antice valde approximatis, extus fere angulatim convexis, antennis fuscis, opacis, dense punctatis, valde serratis, basin prothoracis superantibus, articulo 2° brevi, 3° angusto, ceteris sat late triangularibus; prothorace elytrorum basi vix angustiore, longitudine duplo latiore, antice rotundatim angustato, dorso subtiliter dense punctulato, basi utrinque foveato, margine postico utrinque late sinuato, angulis posticis rectis: scutello triangulari, impressiusculo, elytris sat amplis, ovatis, striatis, striis dense sat subtiliter punctatis, apice paulo profundioribus, intervallis vix convexiusculis; subtus fusca, vage coerulescens, sat nitida, laevis, abdomine subtilissime striolato, tibiis anterioribus leviter arcuatis et tarsis articulis 4 primis sat dilatatis.

Hab. Borneo (Schwaner).—Un seul exemplaire du Museè de Leide.

Ressemble à la *C. induta*, mais plus grande, plus ample, avec les couleurs plus disposées en damier, les yeux plus saillants, le corselet ayant à la base 2 fossettes bien marquées, les stries des èlytres plus finement ponctuées et les tibias antérieurs lègérement arqués.

Ceropria posticalis Motschulsky.

Ceropria posticalis MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 46 (1873) 476.

Statura omni praecedenti [das ist *C. femorata* Motschulsky=*erythrocnema* Castelnau und Brullé] sed color supra castaneo piceus, pedibus posticis abdomineque rufo-testaceis; thorace transverso, subtilissime punctulatis, basi bisinuato, utrinque profunde impresso, angulis posticis pectis; elytris punctato-striatis, interstitiis vix punctulatis. L. 4⅓ lat. 2 l.—Java.

Diese Art ist wahrscheinlich eine unausgefärbte *erythrocnema* oder *versicolor*.

Ceropria insignis Chevrolat.

Ceropria insignis CHEVROLAT, Compt. Rend. Soc. Ent. Belg. 21 (1878) CLI.

Elongato-oblonga, prothorace granuloso, foveis 2 angustis, oblique impressis; elytris confertim punctulato-striatis, macula humerali lata, quartaque parte apicali laete viridibus, infra maculam et limbo parte apicali violaceo-igneis, medio et lineola secundum scutellum aureo-splendidis; capite ante oculos profunde excavato et costato; antennis nigris; epipleurae aureo-flavidis; corpore infra pedibusque (punctatis) aeneo-pallidis.—Ins. Moluccarum (Batchian). Lethierry mirsa.

Der gekörnte Prothorax ist ein sonst in der Gattung nicht vorkommender Charakter. Hier liegt, wie so oft bei Chevrolat, ein Beobachtungsfehler vor.

Nach Blair [6] ist diese Art = *C. intermedia* Harold. Der letztere Name ist der prioritätsberechtigte.

Ceropria (?) yris Chevrolat.

Ceropria (?) yris CHEVROLAT, Compt. Rend. Soc. Ent. Belg. 21 (1878) CLI.

L. 7, lat. 3½ mm. Elongata, postice ampliata, minute et obsolete punctulata, viridi-aenea: elytris striatis, singulo lineis quatuor laete viridi (suturali), marginali 2 humeralibus, lineis quinque rubro-igneis, interstitiis punctulatis; capite punctato, inter oculos sulcato, antennis nigris, ad apicem crassiusculis (6 penultimis), oculis lateralibus rotundatis, magnis reticulatis, prothorace confertim punctulato, marginato et sulcato, supra scutellum recte truncato, scutellum declivi, cordiformi; corpore infra pedibusque confertim punctulatis, aureo-cupreis; femoribus annulo apicali aureo.—Ins. Moluccarum. Lethierry data.

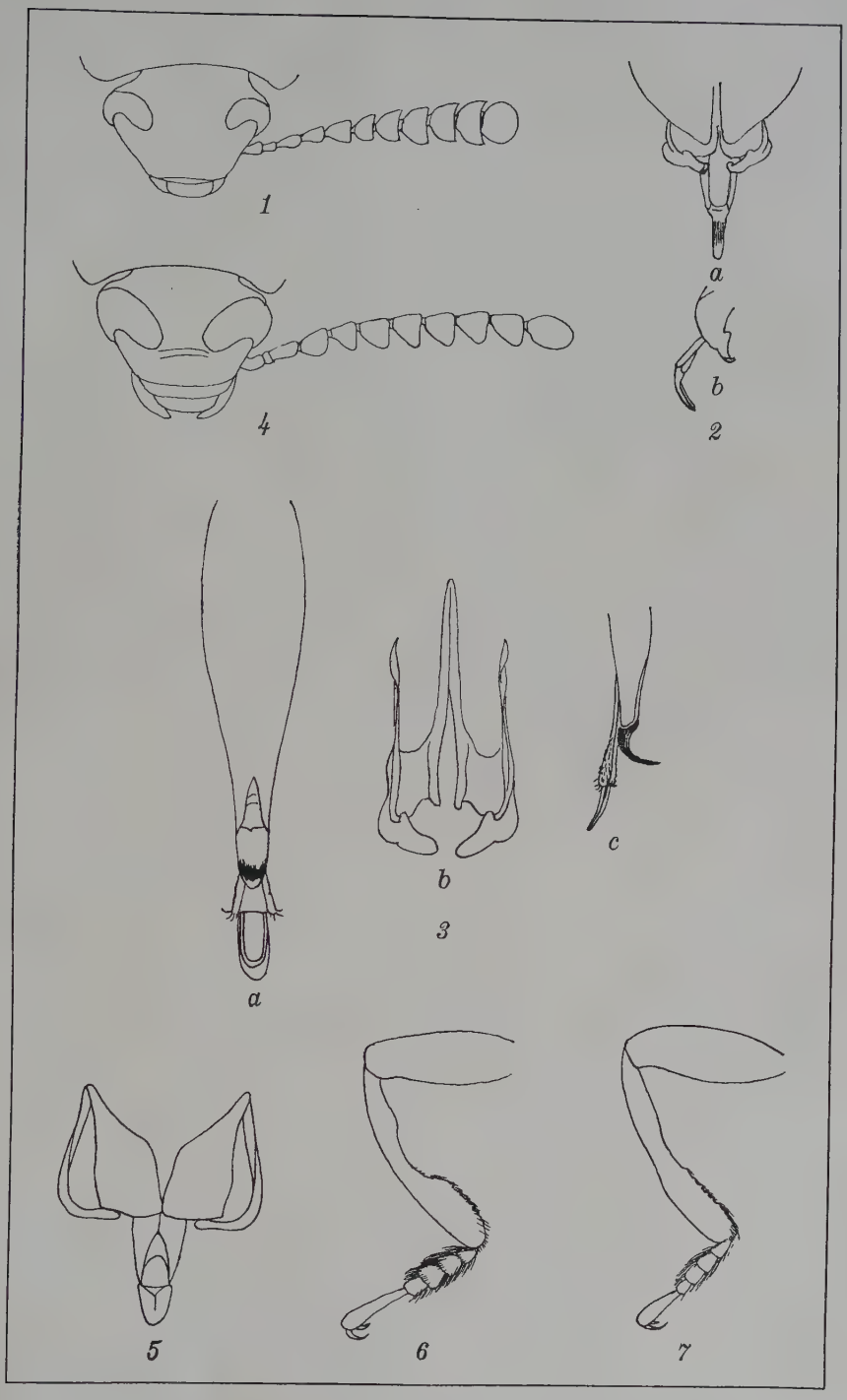
Cet insecte par les articles de ses antennes èpassis et arrondi vers l'extremite, et sa forme èlargie en arrière, devia rentrer dans un nouveau genre propre à cette famille.

[6] Trans. Zool. Soc. London 20[4] (1915) 535.

ILLUSTRATION

Tafel 1

Fig. 1. *Ceropria superba* Wiedemann; Kopf.
2. *Ceropria superba* Wiedemann. Männchen; Sexualapparat; *a*, bei Ansicht von hinten; *b*, bei Ansicht von der Seite.
3. *Ceropria versicolor* Castelnau und Brullé; Geschlechtsapparat; *a*, der eigentliche Penis; *b*, die äusseren Klappen; *c*, Penisspitze.
4. *Ceropria amplipennis* sp. nov.; Kopf.
5. *Ceropria amplipennis* sp. nov.; Männchen; Geschlechtsapparat.
6. *Ceropria mindanaica* sp. nov.; Männchen; Vorderschiene.
7. *Ceropria opulenta* Harold; Männchen; Vorderbein.



TAFEL 1.

THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 27 JULY, 1925 No. 3

A NEW PHILIPPINE SEA ROBIN, FAMILY PERISTEDIIDÆ

By ALBERT W. C. T. HERRE

Chief, Division of Fisheries, Bureau of Science, Manila

ONE PLATE

The deep-water sea robins are very strange-looking and imperfectly known fishes which live ordinarily in rather deep water. They are related to the gurnards, but their specialization has gone much further. The plowlike head is of enormous size in proportion to the body, and is completely inclosed with plates of bone which form a weird armor resembling that of some of the giant Devonian invertebrates; each preorbital is produced into a long flat process which extends on each side beyond the snout; the mouth is large, inferior, and may be toothless, or may have very fine teeth on the upper jaw; the lower jaw is provided with two or more pairs of barbels.

The trunk is elongate, tapering, and covered with bony plates, each of those on the top and sides armed with a strong backward-pointing spine; the dorsal fin may be continuous or divided; the pectoral fin is short or of moderate length, with the two lowermost rays detached, thickened, and fingerlike; the ventrals are I, 5, and are separated by broad flat bony plates which form the surface of the belly; the gill membranes are separate and narrowly joined to the isthmus anteriorly; the gill rakers are slender; an anal papilla is present; the air bladder is simple; there are about ten pyloric cæcæ.

These fantastic fishes, which somewhat resemble young sturgeons, are usually red. Their flat ventral surface is perfectly adapted to life on smooth surfaces at considerable depths. The

free rays of the pectorals are used to turn over stones and mollusks in their search for food. Five or six genera are known, with about two dozen species, occurring in the Indo-Australian, Chinese, and Japanese seas, the tropical Atlantic, and the Mediterranean Sea.

Three genera are known from the Philippines, two new genera having been described from the *Albatross* collections by H. M. Smith. Smith's arrangement of the Philippine genera is here followed.

Key to the Philippine genera of Peristediidæ.

a^1. Both jaws toothless ..... **Peristedion.**

a^2. Upper jaw with teeth; lower jaw toothless.

b^1. Head shield much expanded, flattened, with crenate margin; rostral processes long and flat; barbels highly developed; mouth medium; teeth on premaxillaries in a broad band reaching halfway to angle of mouth ..... **Gargariscus.**

b^2. Head shield little expanded, with entire margin; rostral processes short, spinelike, not flat; barbels short and few; mouth very large; teeth on premaxillaries in a broad band reaching to angle of mouth. **Heminodus.**

Genus **PERISTEDION** Lacépède

Peristedion LACÉPÈDE, Hist. Nat. Poissons 3 (1802) 368.

Peristethus KAUP, Proc. Zool. Soc. London (1859) 103; amended spelling.

Barbels on lower lip and jaw large, forming a long fringed tuft at angles of mouth; in other respects the characters are included above.

A single species, here described as new, is known from the Philippines. Of the sixteen species previously described from Indo-Pacific waters, the Philippine species is closest to *P. rieffeli.*

Peristedion welchi sp. nov. Plate 1.

Dorsal, VII-18; anal, 18; pectoral, II-12; lateral line, 32.

The elongate octagonal body is covered on each side by three series of scalelike armor plates, each of which bears a sharp backward-pointed spine; all the plates are very much broader than long; the dorsal and ventral plates form a concave depression in which the vertical fins are placed; its depth equals its breadth and is contained 5.46 times in the length from tip of snout to posterior end of lateral line; the greatest width of the very large, roughly triangular head is 0.9 of its length from nape to tip of snout and $\frac{7}{8}$ of its true length, namely, from origin of lateral line to tip of snout; length of head con-

tained 2.85 times in head and trunk together; greatest depth of head almost equal to that of body but is approximately only $\frac{4}{7}$ of its own breadth; the large eyes contained 4.36 times in head and 2.5 times in snout; interorbital space is made strongly concave by the broad elevated supraorbital ridges; its breadth is $\frac{10}{11}$ of the length of eye and is contained 4.8 times in head; the snout proper contained about 1.75 times in head; the flat, minutely serrate and convergent prolongations of preorbital extend beyond and partially inclose snout and are $\frac{1}{4}$ as long as head; their length is contained approximately 3.2 times in the distance from eye to their tips; they are continued posteriorly in a flat prominent ridge which ends in a spine that does not extend back as far as the two unequal opercular spines.

The crown is quadrangular and crossed at right angles by two strongly marked sutures; the posterior plates each have a prominent backward-pointing spine; a small spine on each supraorbital ridge at the forward boundary of crown; in the middle of forehead is a triangular spine, from which four ridges radiate like an X, two into the interorbital space and terminating in the supraorbital spines, the other two toward the snout and likewise each terminating in a small triangular spine; in front of each eye at base of supraorbital ridge is a similar but still smaller spine; the surface of all the head cuirass is pitted and sculptured.

On the lower lip are three pairs of barbels, the outer ones very long and branched, the others simple; behind each of the innermost pair of barbels are two smaller ones and behind each of the middle pair is another much smaller one; opposite posterior angle of jaws is a pair of barbels smaller than any of the others.

Two pairs of abdominal plates before vent; those of the first pair have an anterior prolongation and a shallow notch on the posterior margin; the length is $\frac{1}{5}$ greater than the breadth; the second pair is wider than long, with the posterior notch more marked than in the first.

First and second dorsals both low, the longest spines and rays being about 1.5 times eye; anal still lower; pectoral reaches to twelfth scale of lateral line; ventrals extend as far as anus but not to genital opening or papilla; the upper rays of caudal are longest, its length approximately twice that of eye.

Color above in alcohol is pale gray-brown, with the sutures of dorsal plates all marked by broad brown lines; carapace of head nearly uniform reddish gray; underparts uniform pale

yellow; first and second dorsals sparsely sprinkled with small circular spots; anal black-edged; pectorals uniform blackish gray; caudal yellowish. Lines of fine circular shallow pits radiate from spine on each of the dorsal plates, the bottom of each pit dark. In life at least the upper surface of this fish is probably red.

This species is close to *P. rieffeli* Kaup, but differs from the description and figure of the author and the more elaborate diagnosis by Günther. *Peristedion rieffeli* has three abdominal plates before the vent, only two pairs of barbels, and the proportions of the head and body are different. There are also marked differences in the dorsal and anal fins and in the number, size, and shape of the various spines on the armor of the head.

The type and only specimen was caught in a fish corral on the reef in front of Dumaguete, Oriental Negros, in water not more than 6 or 8 meters deep. Its length is 284 millimeters to the tip of the snout, or 308 millimeters including the preorbital processes; adding the caudal fin, the length over all is 351 millimeters.

I take pleasure in naming this species for Thomas Cary Welch, as an appreciation of his interest in scientific matters and the assistance he has given in my studies of Philippine fishes.

ILLUSTRATION

PLATE 1. *Peristedion welchi* sp. nov., dorsal, ventral, and lateral views.

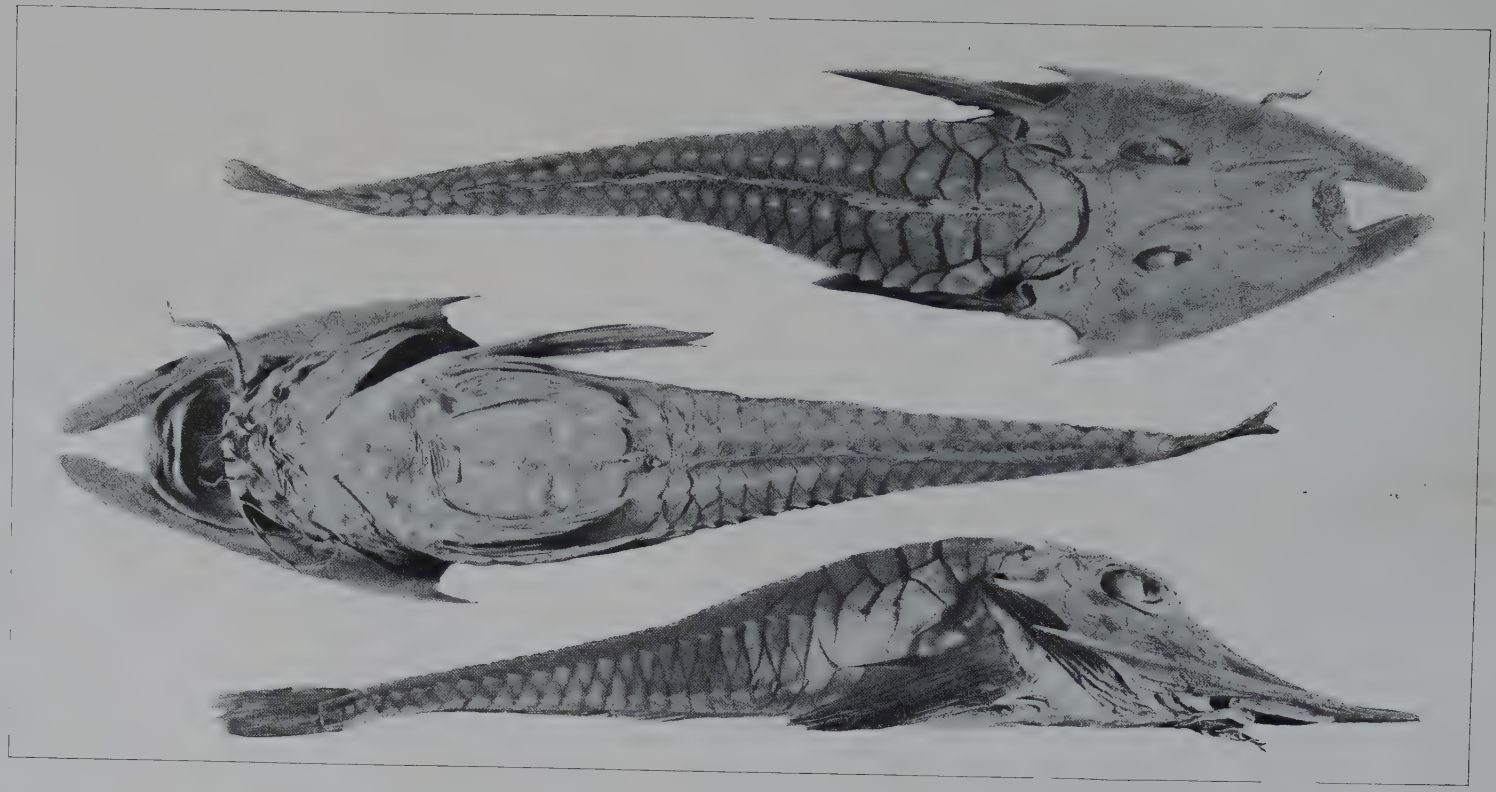


PLATE 1. PERISTEDION WELCHI SP. NOV.

NOTES ON THE CHLORINATION OF THE MANILA WATER SUPPLY

By EDWARD TAYLOR

Chemist for the Metropolitan Water District, at the Bureau of Science, Manila

TWO PLATES AND TWO TEXT FIGURES

The water supplied to the City of Manila was treated for the first time with calcium hypochlorite during the dry months of the year 1912, when water of doubtful quality had to be taken from Mariquina River at Santolan, owing to insufficiency of the river flow at Montalban. The quantity of hypochlorite used was equivalent to about 0.33 part of free chlorine per million parts of water. It appears that no study was made to determine the effect of the treatment, which was discontinued at the end of the dry season.

In 1914 the treatment was resumed and has since then been continued, practically without interruption, on the entire body of water supplied to Manila throughout the year.

FORMER STUDIES

Heise,[1] formerly of the Bureau of Science, made a series of observations in 1914 to study the effect of the hypochlorite treatment on the bacterial content of the city water. He used amounts of disinfectant that varied from 0.5 to 0.75 part of free chlorine per million parts of water. Heise's experiments, which were limited to the months of June and July, gave the following results:

By using a fixed dose of 0.5 part per million (parts available chlorine per million parts of water) a bacterial reduction of less than 50 per cent was effected. A dose of 0.625 part per million gave an average bacterial reduction of 63 per cent. With a dose of 0.75, the bacterial reduction was 65 per cent. With reference to these results Heise states:

> It is interesting to note the greatly increased efficiency of 0.625 part of available chlorine per million as compared with 0.5 and the relatively slight increase in efficiency of 0.75 over 0.625.

[1] Philip. Journ. Sci. § A 11 (1916) 1.

TABLE 1.—*Variation in free chlorine content of the city water at the Bureau of Science.*

Time.	Free chlorine in parts per million.												
	September, 1922.										October, 1922.		
	1	2	4	8	9	12	19	21	22	26	4	13	27
A. M.													
6:00	Nil	Nil	Trace										
6:30	do	Trace	do										
7:00	Trace	do	do										
7:30	do	Nil	do	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Nil	Trace	Trace.
8:00	do	do	do	Nil	Nil	do	do	do	do	do	Trace	Nil	Do.
8:30	Nil	0.35	do	do	do	do	do	do	do	do	do	Trace	Nil.
9:00	do	0.55	do	do	Trace	do	do	0.19	do	do	do	Nil	Do.
9:30	do	0.21	Nil	do	Nil	do	do	Trace	do	do	do	do	Trace.
10:00	0.37	Trace	do	do	Trace	do	do	do	do	do	do	Trace	Do.
10:30	0.40	do	do	do	Nil	do	do	do	do	do	do	do	Do.
11:00	0.33	0.38	Trace	do	do	do	do	0.35	0.20	0.20	do	do	Do.
11:30	0.65	0.35	do	do	do	do	do	0.25	0.23	Trace	do	do	0.15
12:00	0.85	0.35	do	do	do	do	0.16	Trace	0.25	do	do	0.25	Trace.
P. M.													
12:30	0.51	0.25	do	do	do	do	Trace	do	0.26	do	do	Trace	Do.
1:00	0.25	Trace	do	do	do	do	do	do	0.20	Nil	do	0.3	0.10
1:30	Trace	do	do	do		do	Nil	do	Trace	do	do	0.25	Trace.
2:00	Nil	do	do	do		do	Trace	do	do	Trace	do	Trace	Do.
2:30	do	Nil	do	do		do	do	do	do	do	do	0.15	Do.
3:00	do	do	do	do		do	do	do	do	do	do	Trace	Do.
3:30	do	do	do	do		do	do	do	do	do	do	do	Nil.

FORMER CHLORINATION PRACTICE

It seems that, in view of the above results, an invariable dose of about 0.6 part per million was adopted and used with subsequent slight changes in chlorinating the Manila water supply from 1914 until the middle of 1923. Although this plan was not giving very satisfactory results, it was the most expedient that could be carried out uninterruptedly under the attendant circumstances.

One of the disturbing features of this treatment was the intermittent and irregular appearance of residual chlorine in the treated water, as shown in Table 1, which gives some of the results of frequent tests made by the Bureau of Science.

It appears also from Heise's studies and from additional data on record that the bacterial reduction accomplished with the treatment with an invariable dose of chlorine was generally low. Some results of the former treatment are given in Table 2. Two samples of the treated water from different places and one sample of the untreated water from the reservoir were examined daily and the percentage of bacterial reduction was computed from the colony counts. The figures in Table 2 are the averages of the daily results obtained by the biological laboratory of the Bureau of Science.

TABLE 2.—*Bacterial reduction with former treatment used in 1919 and 1921.*

Date.	Average reduction.	
	At San Juan.	At Bureau of Science.
1919	*Per cent.*	*Per cent.*
May	54	45
June	43	29
July	43	48
August	47	77
September	63	79
November	63	60
December	63	66
1921		
January	60	53
February	76	67
April	66	50
May	64	56

A ready explanation for the low efficiency of the treatment can be found in the changeable chlorine-consuming capacity of

the water from Montalban. Heise [2] reports chlorine consumption varying from 0.5 to 1 part per million with a contact period of one hour in samples of the unchlorinated water taken on different days. Recent work has shown the variation to be greater; namely, from 0.4 to 1.4 parts per million with a contact period of about four hours. It can be easily understood, therefore, why the dose of 0.6 part per million that was generally used imparted at times a disagreeable odor to the water and on other occasions produced inefficient sterilization.

The method of applying the hypochlorite solution to the water was in all probability partly responsible for the unsatisfactory results derived from the treatment. At certain times of the day irregularities in dosing the water could occasionally be detected. There have been cases in which the quantity of residual chlorine in the treated water exceeded the dose that was supposed to have been applied. Such a result could not have been obtained unless the workers at the chlorination plant made errors in the measurement of the volume of the hypochlorite solution or in the determination of its strength. The rather crude equipment formerly used did not very well admit of accurate operations.

At any rate, it can be confidently stated that the shortcomings of the invariable dosage plan of chlorination, coupled with irregularities in dosing the water, rendered the former treatment low in efficiency. These unsatisfactory conditions made it necessary to introduce better equipment for chlorination and to put the treatment under careful supervision and control.

PRESENT SYSTEM OF CHLORINATION

In order to accomplish efficient sterilization, the dose of chlorine needs to be constantly adjusted and changed to meet the varying demands of the water. It is along this line that the Manila water supply is being chlorinated at present.

The main factors entering into the laboratory control of the treatment are the quantity of residual chlorine, the colony counts, the presence of *Bacillus coli*, and the turbidity.

RESIDUAL CHLORINE

A certain amount of residual chlorine is maintained at all times in the treated water all over the distribution system. Efforts are made to keep this amount between 0.05 and 0.1 part

[2] Philip. Journ. Sci. § A 11 (1916) 11.

per million by regulating the dosage at the chlorination plant. Tests of the tap water are made several times a day at the laboratory in the city and, to insure complete chlorination, tests are occasionally made of the water in the suburbs of the city and at the dead ends of the system. The orthotolidine test [3] for free chlorine is used. Table 3 shows some results of such examinations including the colony counts and the presumptive tests for *B. coli.*

TABLE 3.—*Examination of water at different points of the Manila water system.*

Tap or hydrant at—	Residual chlorine, parts per million.			Colonies per cubic centimeter.		
	February 23, 1924.	March 12, 1924.	April 23, 1924.	February 23, 1924.	March 12, 1924.	April 23, 1924.
Bureau of Science	0.1	0.15	0.1	2	26	120
End of Vito Cruz	0.07	0.05	0.08	32	34	480
Teheron, Santa Ana	0.09	0.1	0.1	80	12	88
Maypajo Bridge	0.06	0.07	0.05	40	125	325
End of Velazquez	0.05	0.05	0.06	82	105	52
End of Economia	0.15	0.25	0.1	30	8	48

Tap or hydrant at—	Presumptive test in 10 cubic centimeters.		
	February 23, 1924.	March 12, 1924.	April 23, 1924.
Bureau of Science	Negative	Negative	Negative.
End of Vito Cruz	do	do	Do.
Teheron, Santa Ana	do	do	Do.
Maypajo Bridge	do	do	Do.
End of Velazquez	do	do	Do.
End of Economia	do	do	Do.

The dose of chlorine to be given to the water is determined from the amount of hypochlorite (of known strength) being used and the corresponding quantity of residual chlorine. If the latter is between 0.05 and 0.1 part per million no change is made in the dose. If the quantity of residual chlorine becomes too small or too large, the dose is changed accordingly. Thus the dose for any period is dependent on the results of the period immediately preceding.

BACTERIA

In the event that the number of bacteria per cubic centimeter is found to be unusually high, an additional dose of chlorine is

[3] Ellms and Hauser, Journ. Ind. & Eng. Chem. 5 (1913) 915.

used. This precaution is taken, not only to insure the potability of the water, but also to make it conform with the Philippine Health Service standard for artesian waters; namely, not more than 500 colonies per cubic centimeter and no *B. coli* present.

In order to minimize the possibility of contaminating the water with pathogenic organisms, all necessary precautions are taken to have the uninhabited watershed, which comprises about 108 square miles (about 173 square kilometers), well guarded and to have the chlorination carefully controlled in the laboratory and at the plant. As a result, *B. coli* is seldom found in the city water supply as shown by the results of bacteriological analyses made daily of one sample of the untreated water and of two samples of the treated water from two different points.

The gas formers which appear at times in the city water and which are responsible for the positive presumptive test are as a rule not true *B. coli*, but are other members of the *coli* group which are not necessarily of fæcal origin.[4]

TURBIDITY

The turbidity of the city water is determined daily and, as water of high turbidity usually contains a relatively large amount of organic matter and suspended materials that may occlude the bacteria or that may absorb chlorine before disinfection can take place, an appreciable rise in turbidity usually has to be attended by an increase in the dose of chlorine.

In this connection it is interesting to note that as far as the city water supply (which is not subjected to filtration) is concerned, the turbidity is more or less directly proportional to the amount of rainfall in the vicinity of the watershed. This relationship can be readily seen from the turbidity and rainfall diagrams given in fig. 1.

It will also be noticed on examination of fig. 2 that a marked rise in turbidity usually follows one day after a relatively heavy rainfall in the neighborhood of the watershed. The amount of rain falling in one day, therefore, may be used partly as an index of the dose of chlorine that must be added to the water the following day. A dose of chlorine given this way would be more timely than the same dose determined and added after the results of laboratory tests are obtained.

[4] Schöbl and Ramirez, postea, 317.

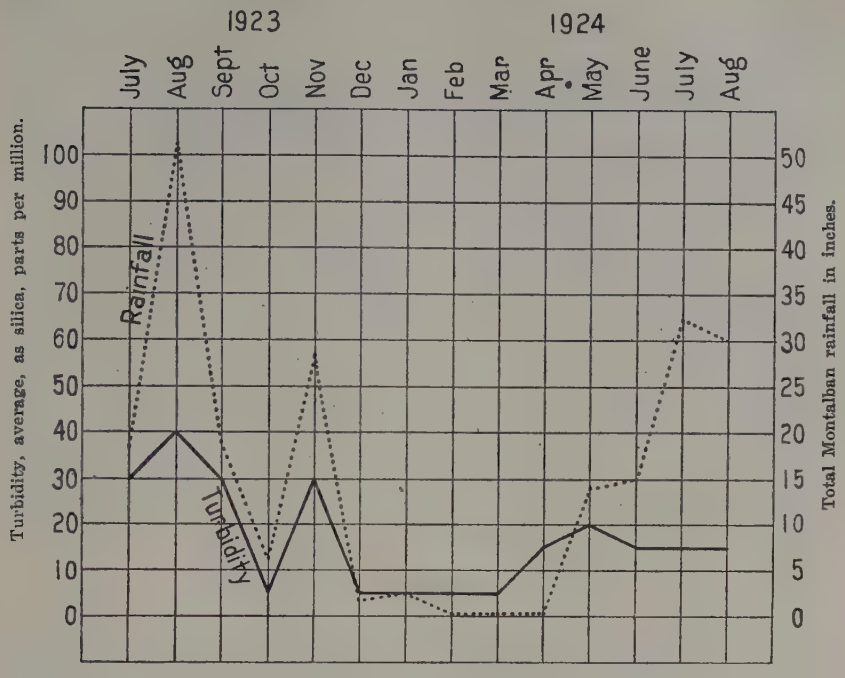


FIG. 1. Monthly variations in turbidity and rainfall.

While it is true that a high turbidity requires a higher dosage due to an increased chlorine-consuming capacity, the converse is not necessarily true. It is hard to find direct relationship between turbidity and chlorine absorption. The turbidity may remain constant for some time while the chlorine-consuming power may change. The turbidity may fluctuate, but the chlorine-consuming power may not closely follow the fluctuations, although it may tend to rise with an increase in turbidity. An examination of Table 1 will verify this statement.

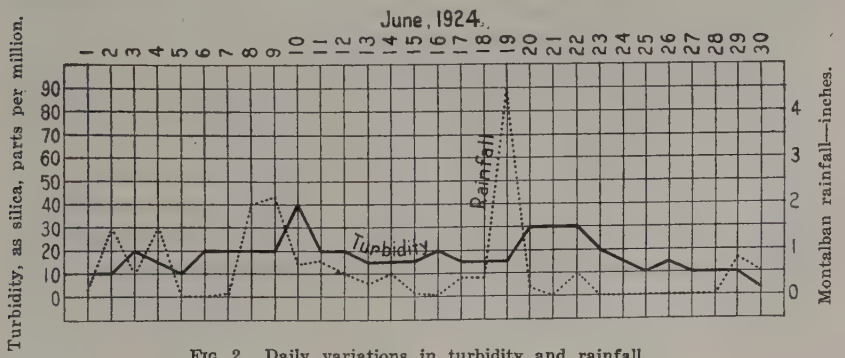


FIG. 2. Daily variations in turbidity and rainfall.

Sperry and Billings [5] report only a general relationship between river-water turbidity and chlorine absorption, direct relationship being absent. When we consider that the composition of the materials making up the turbidity may vary and that chlorine-absorbing substances may sometimes be in solution and sometimes in suspension, it is not surprising to find a lack of direct connection between turbidity and chlorine absorption.

Some difficulty has been experienced in testing for residual chlorine with *o*–tolidine when the water is turbid. It seems that either the color of the suspended matter or the slightly opaque condition of the water interferes with the yellow color produced by the *o*-tolidine. The resulting color sometimes corresponds to a figure lower than the actual chlorine content, and sometimes is of a shade that is not comparable with the standards; *o*-tolidine is suitable for only clear or filtered waters. The cause of the interference and its remedy are being made the subject of study at present.

RESULTS OF PRESENT TREATMENT

Under the present system of chlorination and with the improved equipment, the sterilization of the Manila water supply is more effective and efficient than under the older treatment. The low colony counts, together with the almost complete absence of pathogenic organisms, make the city water safe for drinking purposes. Table 4 gives the bacterial reductions accomplished with the present treatment. Although the reductions are not as great as is desirable, they point to a decided improvement. The figures in Table 4 were obtained in the same way as were those of Table 2.

A record of the tests for residual chlorine, for turbidity, for the colony counts, and for *Bacterium coli*, together with the doses used in the present treatment, is given in Table 5. A word of explanation regarding those tests will be convenient.

The second column shows the results of tests for residual chlorine in parts per million made of water from a spigot at the Bureau of Science, where the control work is done. The tests are made at different hours of the day, the usual hours being 8 a. m., 12 a. m., 2 p. m., and 4 p. m. As previously stated, *o*-tolidine is used for the determinations. Results in terms of "positive," "nil," etc., indicate that quantitative tests

[5] Journ. Am. Water Works Assoc. 8 (1921) 603.

could not be made, owing to interference of the turbidity or color of the water.

The turbidity is reported in parts per million of silica. The silica comparison method of the American Public Health Association is used.

The fourth column gives the number of colonies found per cubic centimeter on agar incubated at 37° C for forty-eight hours.

TABLE 4.—*Bacterial reduction with present treatment.*

Date.	Average reduction.	
	At San Juan.	At Bureau of Science.
1923	*Per cent.*	*Per cent.*
July	76	80
August	80	83
September	84	87
October	86	79
November	80	83
December	76	77
1924		
January	91	81
February	87	89
March	74	74
April	78	67
May	68	60
June	83	72
July	80	77
August	82	85

TABLE 5.—*Results of examination of city water and record of dosage.*[a]

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1923					
October 1			30	Negative	
October 2			2	do	0.9
October 3	Present	15	30	do	0.9→0.8
October 4	do	40	40	do	0.8
October 5	Present; trace	40	40	do	0.8
October 6	Trace; present	30	36	do	0.8
October 7	Nil; trace; present	40	[b] 5,720	do	0.8
October 8	Nil; trace; nil	40	120	do	0.8→0.9
October 9			430	do	0.9
October 10	0.2; 0.06; 0.2	15	16	do	0.9→0.8
October 11	0.3; 0.2; 0.2; 0.3	15	40	do	0.8

[a] No record is given for November, 1923, because the reservoir and the chlorination plant were cleaned and repaired during that month. Although the water was chlorinated, the dosing was not very accurate.

[b] There is ample reason to believe that counts like these, which are unusually high, nonpersistent, and far from the average, are due to local pollution and do not represent the real quality of the water.

TABLE 5.—*Results of examination of city water and record of dosage*—Continued.

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1923					
October 12	0.2; 0.3; 0.2; 0.1	15	30	Negative	0.8
October 13	0.2; 0.25	5	4	do	0.8
October 14	Present	5	12	do	0.8
October 15	0.25; 0.3; 0.3	15	20	do	0.8→0.7
October 16	0.2; 0.25; 0.2; 0.3	15	8	do	0.7
October 17		5	18	do	0.7
October 18	0.2; 0.2	10	4	do	0.7
October 19	0.2; 0.3	5	4	do	0.7
October 20	0.2; 0.3	5	4	do	0.7
October 21	0.1	5	50	do	0.7
October 22	0.1	5	30	do	0.7
October 23	0.2; 0.3	5	16	do	0.7
October 24	0.2; 0.2; 0.2	5	100	do	0.7
October 25	0.07; 0.2; 0.3	5	40	do	0.7
October 26	0.2; 0.3; 0.3; 0.25; 0.3	5	90	do	0.7
October 27	0.3; 0.25; 0.3	5	400	do	0.7
October 28		5	[b] 22,890	do	0.7
October 29	0.4; 0.1; 0.15	5	28	do	0.7→0.6
October 30	0.3; 0.3; 0.2; 0.3	10	12	do	0.6
October 31	0.35; 0.25; 0.35; 0.3	10	8	do	0.6
December 1	0.25; 0.5; 0.5; 0.5	10	1,200	do	0.6→0.7
December 2			16	do	0.7
December 3	0.3; 0.3; 0.4	10	8	do	0.7→0.6
December 4	0.2; 0.3; 0.25; 0.2	10	8	do	0.6
December 5	0.25; 0.3; 0.25; 0.25	10	4	do	0.6
December 6	0.04; 0.04; 0.04; 0.03	20	34	do	0.6→0.7
December 7	0.07; 0.08; 0.15; 0.2	15	2,540	Positive	0.7→0.8
December 8	0.2; 0.25; 0.3	10	10	Negative	0.8
December 9			2	do	0.8
December 10	0.25; 0.4; 0.35; 0.35	5	8	do	0.8→0.7
December 11	0.2; 0.35; 0.4	5	6	do	0.7→0.6
December 12	0.2; 0.3; 0.3; 0.35	5	4	do	0.6
December 13	0.2; 0.4; 0.35; 0.45	5	8	do	0.6
December 14	0.2; 0.35; 0.4	5	4	do	0.6
December 15	0.25; 0.3; 0.3	5	1,900	do	0.6
December 16		5	2	do	0.6
December 17	0.25; 0.35; 0.35; 0.35	5	8	do	0.6
December 18	0.2; 0.25; 0.2; 0.15	5	16	do	0.6
December 19		5	12	do	0.6
December 20		5	34	do	0.6
December 21		5	1,900	do	0.6→0.8
December 22	0.5; 0.4; 0.4	5	2	do	0.8→0.6
December 23		5	15	do	0.6
December 24	0.08; 0.3; 0.2; 0.4	5	2	do	0.6
December 25		5	2	do	0.6
December 26	0.2; 0.3; 0.3; 0.3	5	12	do	0.6
December 27	0.3; 0.3; 0.2; 0.2	5	0	do	0.6

[b] There is ample reason to believe that counts like these, which are usually high, non-persistent, and far from the average, are due to local pollution and do not represent the real quality of the water.

TABLE 5.—*Results of examination of city water and record of dosage*—Continued.

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1923					
December 28		5	0	Negative	0.6
December 29	0.3; 0.3; 0.3	5	10	do	0.6
December 30		5	36	do	0.6
December 31		5	2	do	0.6
1924					
January 1		5	6	do	0.6
January 2	0.5; 0.4; 0.3	5	2	do	0.6
January 3	0.5; 0.4; 0.2; 0.2	15	15	do	0.6
January 4	0.4; 0.25; 0.3; 0.3	5	10	do	0.6
January 5	0.3; 0.2	5	4	do	0.6
January 6	0.3; 0.3	5	22	do	0.6
January 7	0.2; 0.2; 0.2; 0.3	5	4	do	0.6
January 8	0.35; 0.2; 0.2; 0.2	5	78	do	0.6
January 9	0.4; 0.2; 0.3; 0.35	5	28	do	0.6
January 10	0.07; 0.3; 0.2; 0.3	5	10	do	0.6
January 11	0.3; 0.2; 0.2; 0.3	5	66	do	0.6
January 12	0.5; 0.4; 0.3	5	6	do	0.6→0.7
January 13	0.25; 0.15	5	4	do	0.7
January 14	0.2; 0.2; 0.2; 0.2	5	6	do	0.7
January 15	0.08; 0.06; 0.04	5	60	do	0.7→0.9
January 16	0.2; 0.1; 0.1; 0.15	5	630	do	0.9
January 17	0.1; 0.08; 0.07; 0.1	5	104	do	0.9→1.0
January 18	0.3; 0.3; 0.3; 0.2	5	10	do	1.0
January 19	0.35; 0.3	5	18	do	1.0
January 20		5	60	do	1.0
January 21	0.2; 0.25; 0.4; 0.4	5	12	do	1.0
January 22	0.4; 0.3; 0.4; 0.5	5	16	do	1.0→0.8
January 23	0.3; 0.2; 0.2; 0.3	5	6	do	0.8
January 24	0.4; 0.3; 0.2; 0.3	5	8	do	0.8
January 25	0.3; 0.3; 0.4	5	630	do	0.8→0.6
January 26	0.2; 0.2	5	6	do	0.6
January 27	0.2	5	6	Positive	0.6
January 28	0.2; 0.2; 0.2; 0.2	5	14	Negative	0.6
January 29	0.1; 0.2; 0.2; 0.2	5	8	do	0.6
January 30	0.1; 0.2; 0.2	5	10	do	0.6
January 31	0.2; 0.1; 0.1	5	12	do	0.6→0.5
February 1	0.15; 0.08; 0.1; 0.15; 0.15	5	38	do	0.5
February 2	0.15; 0.1; 0.15	5	12	do	0.5
February 3		5	12	do	0.5
February 4	0.1; 0.08; 0.1	5	28	do	0.5
February 5	0.15; 0.2; 0.1; 0.1	5	2	do	0.5
February 6	0.15; 0.08; 0.1	5	2	do	0.5
February 7	0.25; 0.06; 0.05; 0.05	5	4	do	0.5
February 8	0.2; 0.1; 0.1; 0.08	5	4	do	0.5
February 9	0.2; 0.15; 0.15	5	0	do	0.5
February 10		5	2	Positive	0.5
February 11	0.08; 0.1; 0.06; 0.06	5	10	Negative	0.5→0.6
February 12	0.1; 0.1; 0.1; 0.1	5	16	Positive	0.6
February 13	0.15; 0.1; 0.15; 0.2	5	4	Negative	0.6
February 14	0.1; 0.15; 0.15	5	8	do	0.6

TABLE 5.—*Results of examination of city water and record of dosage*—Continued.

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1924					
February 15	0.2; 0.1; 0.1	5	2	Negative	0.6
February 16	0.2; 0.06	5	2	do	0.6
February 17		5	4	do	0.6
February 18	0.2; 0.08	5	0	Positive	0.6
February 19	0.15; 0.1	5	2	Negative	0.6
February 20	0.08; 0.1	5	500	do	0.6
February 21	0.1; 0.08	5	2	do	0.6→0.7
February 22	0.2	5	2	do	0.7
February 23	0.1; 0.08	5	2	do	0.7
February 24	0.1	5	2	do	0.7
February 25	0.08; 0.1; 0.08; 0.08	5	2	do	0.7→0.8
February 26	0.2; 0.1; 0.1; 0.1	5	6	do	0.8
February 27	0.1; 0.1; 0.1; 0.1	5	2	do	0.8
February 28	0.2; 0.06; 0.06; 0.04	5	2	do	0.8
February 29	0.06; 0.08; 0.1; 0.09	5	2	do	0.8→0.9
March 1	0.1; 0.08	5	16	do	0.9
March 2		5	10	do	0.9
March 3	0.1; 0.1; 0.08	5	8	do	0.9
March 4	0.1; 0.1; 0.1; 0.1	5	2	do	0.9
March 5	0.09; 0.1; 0.15	5	14	do	0.9→0.7
March 6		5	162	do	0.7
March 7	0.06; 0.07; 0.08; 0.1	5	2	do	0.7
March 8	0.09; 0.09	5	16	do	0.7
March 9		5	4	do	0.7
March 10	0.1; 0.07; 0.07; 0.1	5	6	do	0.7
March 11	0.1; 0.07; 0.07; 0.07	5	4	do	0.7
March 12	0.07; 0.05; 0.06; 0.04	5	28	do	0.7→0.8
March 13	0.15; 0.1; 0.08; 0.1	5	8	do	0.8
March 14	0.1; 0.07; 0.1; 0.1	5	42	do	0.8
March 15	0.1; 0.07	5	140	do	0.8
March 16		5	40	do	0.8
March 17	0.1; 0.1; 0.1	5	10	do	0.8
March 18	0.08; 0.08; 0.08; 0.08	5	6	do	0.8
March 19	0.1; 0.1; 0.1; 0.1	5	4	do	0.8
March 20	0.07; 0.1; 0.1; 0.1	5	8	do	0.8
March 21	0.15; 0.1; 0.07; 0.07	5	40	do	0.8
March 22	0.1; 0.1	5	6	do	0.8
March 23	0.08	5	2	do	0.8
March 24	0.09; 0.07; 0.07	5	8	do	0.8
March 25	0.1; 0.09; 0.09; 0.07	5	10	do	0.8
March 26	0.1; 0.09; 0.1; 0.09	5	8	do	0.8
March 27	0.1; 0.1; 0.09; 0.1	5	16	do	0.8
March 28		5	40	do	0.8
March 29	0.15; 0.1	5	40	do	0.8
March 30		5	20	do	0.8
March 31	0.05; 0.06	5	22	do	0.8
April 1	0.1; 0.09; 0.06; 0.05	15	30	do	0.8
April 2	0.5; 0.08; 0.07; 0.06; 0.04	15	2	do	0.8
April 3	0.1; 0.06; 0.04	10	36	do	0.8

TABLE 5.—*Results of examination of city water and record of dosage*—Continued.

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1924					
April 4	0.08	15	24	Negative	0.8
April 5	0.05; 0.05	15	52	do	0.8
April 6	0.05; 0.05	15	60	do	0.8
April 7	0.08; 0.08; 0.08	15	28	do	0.8
April 8	0.08; 0.1	15	52	do	0.8
April 9	0.08; 0.1	10	56	do	0.8
April 10	0.07; 0.07	10	80	do	0.8
April 11	0.07	10	50	do	0.8
April 12	0.07; 0.07	10	58	do	0.8
April 13		10	18	do	0.8
April 14	0.7; 0.09	5	16	do	0.8
April 15	0.09; 0.09	10	150	do	0.8
April 16	0.1; 0.1	15	96	do	0.8
April 17		20	4	do	0.8
April 18		15	100	do	0.8
April 19	0.1	15	56	do	0.8
April 20		15	18	do	0.8
April 21	0.9	15	630	do	0.8
April 22	0.09; 0.1; 0.09; 0.1	15	48	do	0.8
April 23	0.4; 0.1; 0.09	15	24	do	0.8
April 24	0.2; 0.1	15	8	do	0.8
April 25	0.1; 0.1; 0.09	15	48	do	0.8
April 26	0.1; 0.1	20	84	do	0.8
April 27		20	70	do	0.8
April 28	0.1; 0.1; 0.1	20	80	do	0.8
April 29	0.15; 0.1; 0.1	20	18	do	0.8→0.7
April 30	0.1; 0.1	20	30	do	0.7
May 1		15	2	do	0.7
May 2		10	310	do	0.7
May 3		10	20	do	0.7
May 4		10	10	do	0.7
May 5	0.1; 0.2	10	20	do	0.7
May 6	0.1; 0.1	15	70	do	0.7
May 7	0.1; 0.09; 0.09	15	74	do	0.7
May 8	0.1; 0.1; 0.08	15	40	do	0.7
May 9	0.2; 0.1; 0.15	15	110	do	0.7→0.6
May 10	0.1	15	20	do	0.6
May 11		15	100	do	0.6
May 12	0.08; 0.08; 0.08	15	30	do	0.6
May 13	0.09; 0.09; 0.08	15	86	do	0.6
May 14	0.09; 0.09; 0.09	15	1,900	do	0.6
May 15	0.07; 0.1	20	700	do	0.6
May 16	0.3; 0.1	20	51,510	do	0.6
May 17	0.1; 0.09	20	260	do	0.6
May 18		20	3,495	do	0.6
May 19	0.1; 0.1	20	11,440	do	0.6
May 20	0.1; 0.1	20	2,540	do	0.6
May 21	0.1; 0.1	20	8,585	do	0.6
May 22	0.1; 0.15	20	44	do	0.6

TABLE 5.—*Results of examination of city water and record of dosage*—Continued.

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1924					
May 23	0.15; 0.2	20	66	Negative	0.6
May 24	0.09; 0.1	20	6	do	0.6
May 25		20	72	do	0.6
May 26	0.1; 0.09	15	190	do	0.6
May 27	0.04; 0.04	20	1,200	do	0.6→0.7
May 28	0.04; 0.04	30	5,720	do	0.7→0.8
May 29	0.01; 0.03	40	3,180	do	0.8→0.9
May 30	0.01; 0.02	40	4,350	do	0.9→1.0
May 31	0.01; nil	40	2,540	do	
June 1		10	300	do	1.0
June 2	0.03; 0.03	10	700	do	1.0
June 3	0.04; 0.04	20	1,000	do	1.0
June 4	0.05; 0.03	15	550	do	1.0
June 5	0.03; 0.03	10	3,810	do	1.0
June 6	0.03; 0.02	20	320	do	1.0
June 7	0.03; 0.03	20	426	do	1.0
June 8			630	do	1.0
June 9	0.04; 0.03	20	240	do	1.0
June 10	Nil; nil	40	200	do	1.0
June 11	Nil; nil	20	210	do	1.0→1.2
June 12	Nil; 0.01	20	80	do	1.2
June 13	Nil; 0.01	15	5,720	do	1.2
June 14	0.01; 0.01	15	160	do	1.2→1.3
June 15			280	do	1.3
June 16	0.03; 0.02; 0.03; 0.03	20	200	do	1.3
June 17	0.08; 0.08	15	60	do	1.3→1.4
June 18	0.1; 0.15; 0.2; 0.2	15	52	do	1.4→1.2
June 19	0.06; 0.1; 0.2; 0.2	15	44	do	1.2
June 20	Nil; nil; 0.01; nil	30	900	do	1.2→1.3
June 21	Trace; 0.01	30	256	do	1.3
June 22			130	do	1.3
June 23	0.1; 0.08; 0.08; 0.08	20	600	do	1.3
June 24	0.02; 0.05; 0.05; 0.2	15	100	do	1.3
June 25	0.1; 0.2; 0.2; 0.2	10	114	do	1.3→1.2
June 26	0.1; 0.2; 0.2; 0.2	15	24	do	1.2
June 27	0.2; 0.2; 0.2	10	8	do	1.2→1.1
June 28	0.1; 0.2; 0.2	10	26	do	1.1→1.0
June 29			160	do	1.0
June 30	0.2; 0.2; 0.2	5	40	do	1.0
July 1	0.1; 0.1; 0.1; 0.1	5	12	do	1.0
July 2	0.15; 0.15; 0.15; 0.15	10	22	do	1.0
July 3	0.15; 0.15; 0.1; 0.1	5	18	do	1.0→0.9
July 4			84	do	0.9
July 5	0.04; 0.05	10	132	do	0.9
July 6			1,144	do	0.9
July 7	0.05; 0.06; 0.06; 0.06	10	24	do	0.9
July 8	0.04; 0.06; 0.06; 0.05	10	28	do	0.9
July 9	0.05; 0.05; 0.06; 0.07	10	40	do	0.9
July 10	0.06; 0.03	10	120	do	0.9

TABLE 5.—*Results of examination of city water and record of dosage*—Continued.

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1924					
July 11	0.05; 0.06; 0.07; 0.07	10	26	Negative	0.9
July 12	0.06; 0.06	5	100	do	0.9
July 13			106	do	0.9
July 14	0.05; 0.05; 0.05; 0.05	5	76	do	0.9
July 15	0.04; 0.04; 0.04	10	80	do	0.9
July 16	0.01; 0.02; 0.02	30	130	do	0.9
July 17	Nil; present; present	30	146	do	0.9→1.2
July 18	Present; present; present; present.	40	20	do	1.2
July 19	Present; 0.15	40	190	do	1.2
July 20			30	do	1.2
July 21	0.3; 0.3; 0.3; 0.3	20	30	do	1.2→1.0
July 22	0.5; 0.2; 0.1; 0.05	20	30	do	1.0→0.8
July 23	0.2; 0.2; 0.2; 0.2	20	190	do	0.8
July 24	0.15; 0.1; 0.1; 0.1	20	100	do	0.8
July 25	0.1; 0.07; 0.05; 0.05	25	68	do	0.8
July 26		20	30	do	0.8
July 27			50	do	0.8
July 28	0.3; 0.3; 0.25; 0.2	10	20	do	0.8→0.7
July 29	0.2; 0.2; 0.15; 0.15	10	40	do	0.7→0.6
July 30	0.15; 0.2; 0.2; 0.2	5	120	do	0.6
July 31	0.2; 0.2; 0.2; 0.2	10	10	do	0.6
August 1	0.1; present; present	20	2,850	do	0.6→0.7
August 2	0.1		11,440	do	0.7
August 3			48	do	0.7
August 4	0.3; present; present; present.	25	70	do	0.7→0.6
August 5	Present; trace; nil; nil	40	180	do	0.6→0.8
August 6	Trace; trace; present; present.	40	116	do	0.8→1.0
August 7	Present; present; present; present.	50	96	do	1.0
August 8	Present; present; present; present.	30	60	do	1.0
August 9	Present; present	30	120	do	1.0
August 10			12	do	1.0
August 11	Present; 0.4; 0.4; 0.5	10	56	do	1.0→0.8
August 12	0.4; 0.3; 0.2; 0.2	10	16	do	0.8→0.6
August 13			28	do	0.6
August 14	0.2; 0.2; 0.2; 0.2	5	10	do	0.6
August 15	0.2; 0.2; 0.2; 0.2	5	40	do	0.6
August 16	0.3; 0.2	5	26	do	0.6→0.5
August 17			18	do	0.5
August 18	0.15; 0.2; 0.2; 0.2	5	8	do	0.5
August 19	0.15; 0.2; 0.2; 0.2	5	46	do	0.5
August 20	0.15; 0.2	5	24	do	0.5
August 21	0.2; 0.2; 0.1	5	28	do	0.5→0.4
August 22	0.06; 0.03	5	52	do	0.4
August 23	0.06	5	152	do	0.4

TABLE 5.—*Results of examination of city water and record of dosage*—Continued.

Date.	Residual chlorine, parts per million.	Turbidity, parts per million.	Bacteria per cubic centimeter.	*Bacillus coli* test.	Chlorine dose, parts per million.
1924					
August 24	----------	----------	180	Negative	0.4
August 25	Nil; trace; present	30	116	do	0.4→1.0
August 26	0.3; 0.3; 0.3; 0.3	10	26	do	1.0→0.7
August 27	0.1; 0.2; 0.2; 0.2	10	5,720	do	0.7
August 28	0.2; 0.2; 0.2; 0.2	10	22	do	0.7→0.6
August 29	0.15; 0.2; 0.25	5	2	do	0.5
August 30	0.2; 0.15	10	18	do	0.6→0.5
August 31	----------	----------	10	do	0.5

The fifth column records the results of examinations for *Bacillus coli* in samples of 1 and 10 cubic centimeters. The examination consists of a preliminary presumptive test showing presence or absence of gas formers in lactose broth followed by a confirmatory test for *B. coli* with eosine-methylene-blue agar. The bacteriological examinations are conducted by the biological division of the Bureau of Science. The samples are taken from a tap at that laboratory.

The last column gives the doses of chlorine in parts per million used each day. The changes in dosage are indicated by arrows.

It will be noted from Table 5 that the average colony counts for the months of May and June are comparatively high. Referring to fig. 1, it will be seen that heavy rainfall in Montalban began in May and continued for a few months. From Table 4 we find that for May, 1922, the bacterial reduction was lowest. These observations do not disclose anything new, but merely bring to mind the effect of rainfall and of the accompanying surface washings upon the bacterial content of river water. It seems that we cannot very well cope with such a situation by means of chlorination alone. Undoubtedly, filtration would be of great help.

The colony counts mentioned in the preceding paragraph are comparatively high, but not so high as to render the water unsafe, especially when the practically complete absence of *B. coli* is taken into consideration.

SUMMARY AND CONCLUSION

Chlorination of the Manila water supply began in 1914 and continued under the invariable dosage plan until the middle of 1923 when control of the treatment was introduced.

A comparison of the percentages of bacterial reduction accomplished with the former and with the present treatment shows the increased effectiveness and efficiency of the treatment under control.

The dose of chlorine is controlled by constantly adjusting and changing the quantity of hypochlorite of known strength added, in order to meet the varying demands of the water.

A heavy rainfall in the vicinity of the watershed generally occasions a marked increase in turbidity and, incidentally, in the colony counts as well. No definite relationship, however, has been found to exist between turbidity and chlorine-consuming capacity.

A record of the chemical and bacteriological tests used in the control of the chlorination for the past months is given (Table 5).

The present work was carried out under the supervision of the division of inorganic and physical chemistry of the Bureau of Science. The bacteriological examinations were conducted by the biological laboratory of the same Bureau. I wish to express my gratitude to the heads of these divisions for valuable help given me in this work.

ILLUSTRATIONS

PLATE 1

FIG. 1. Chlorination house and laboratory, new reservoir, San Juan, Rizal Province, Luzon.
2. Portion of reservoir, San Juan, Rizal Province, Luzon.

PLATE 2

Chlorination apparatus, new reservoir, San Juan, Rizal Province, Luzon.

TEXT FIGURES

FIG. 1. Diagram showing monthly variations in turbidity and rainfall.
2. Diagram showing daily variations in turbidity and rainfall.

Fig. 1. Chlorination house and laboratory.

Fig. 2. Portion of reservoir, San Juan.

PLATE 1.

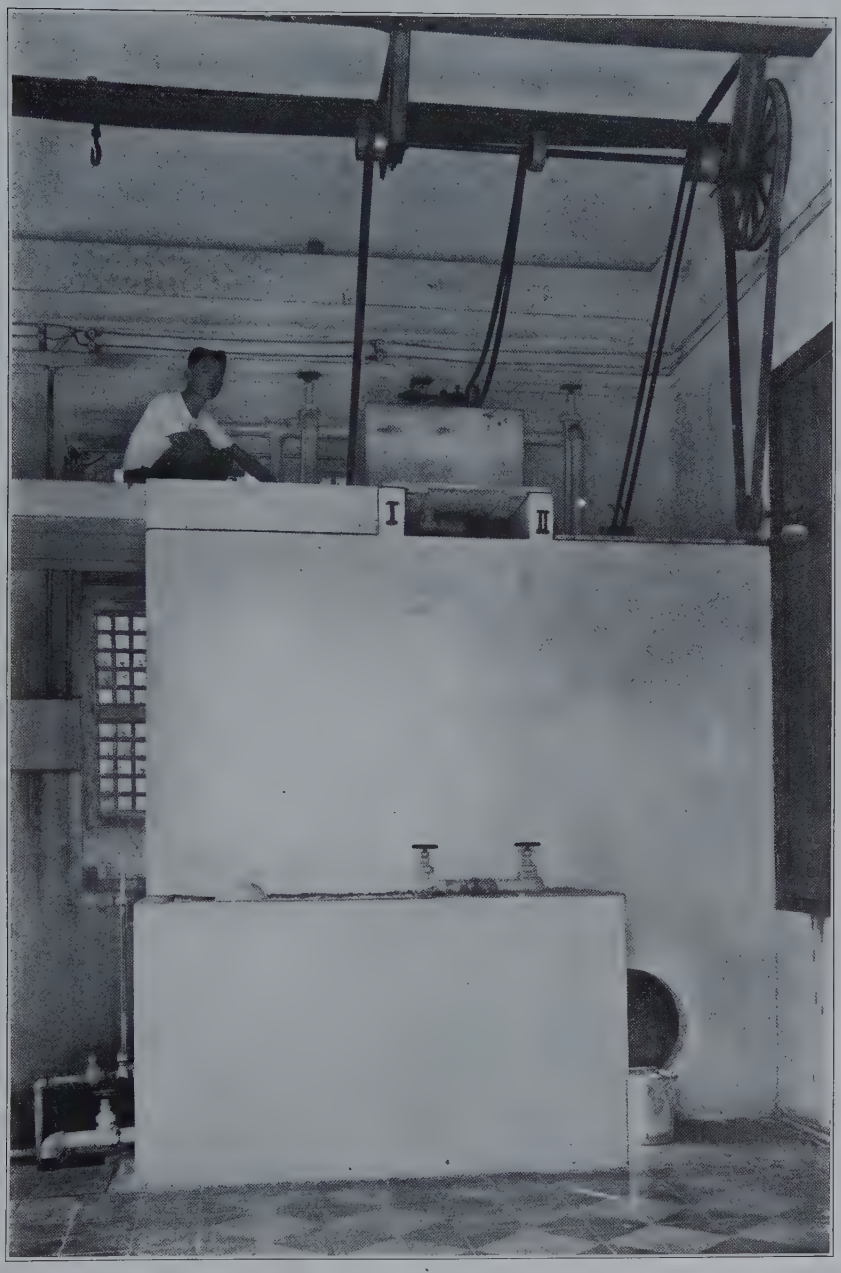


PLATE 2. CHLORINATION APPARATUS, NEW RESERVOIR, SAN JUAN, RIZAL.

THE FALLACY OF THE TEST FOR LACTOSE FERMENTERS AS AN INDICATOR OF FÆCAL POLLUTION OF WATERS

By Otto Schöbl and José Ramirez

Of the Biological Laboratory, Bureau of Science, Manila

In view of the importance attributed to the presence in water of lactose fermenters as an indication of fæcal pollution, the present study was undertaken in order to ascertain if the presence of lactose fermenters in general or some of the members in particular can be reasonably considered as an indication of contamination by human or animal excreta. The present investigation deals with two questions, namely:

Are the representatives of the *Bacillus coli* group, in the broad sense of the term, limited to human and animal excreta exclusively or predominantly so that their presence can be reasonably taken as indication of fæcal pollution, or are they so widely distributed in nature that their ubiquity makes it unreasonable to consider their presence in water as indication of fæcal contamination?

Can *B. coli* of human origin be differentiated from that of animal source?

There is more of local importance than of general interest to these investigations, for the reason that it had been recommended to close permanently certain public "artesian wells" in Manila because of the fact that lactose fermenters were found to be present in the well waters. Altogether twenty-three wells were condemned in Manila.

In view of the importance which the permanent closing of these wells would have from both an economic and a sanitary viewpoint, a committee was appointed by the Director of Health to study thoroughly the condition of the wells from the sanitary standpoint and make recommendations as to the ultimate fate of these wells.

Upon inspection by the committee it was found that there was a possibility of surface contamination of the wells through a permeable wooden plug by which the upper end of the casing

was closed. It was decided to eliminate the surface contamination first, so as to obtain information about the real condition of the well casings. The faulty wooden plugs were replaced by new disinfected ones, and they were inclosed in a concrete block. Thus the surface contamination was eliminated and the examination of the well water as it comes out on pumping was commenced. A subcommittee collected the samples of water from all of the condemned wells personally, taking three samples from each well, one at the commencement of pumping, one after thirty minutes, and one after sixty minutes pumping. Bacteriologic examination was made not later than two hours after the sample had been collected.

The striking features of the results of the examination, briefly stated, were as follows:

Rapid decrease of colonies in the well water on pumping.
Constant positive presumptive test in spite of low colony count.
Constant finding of the lactose fermenters in all the wells, though located far from each other.
The fact that the lactose fermenters were the only bacteria found, except in the case of some of the samples collected at the commencement of pumping which also contained molds, spore-bearing bacteria from the *subtilis* group, and *B. pyocyaneus*.

Due to the fact that only one kind of bacteria was encountered and on account of the sudden decrease of the number of colonies and the very low colony count in the sample collected after prolonged pumping, any underground leakage through the well casing was reasonably excluded, and it was suspected that some part of the pump harbored the bacteria found so constantly and exclusively, and that it served as a focus of contamination. Several pumps were taken apart and the parts made of organic material, such as hemp packing and leather washers, were examined and found to harbor lactose fermenters in large numbers. After proper disinfection of these parts of the pump with strong lysol the entire pump was disinfected in situ with a sufficient amount of formaline. Next day the well was pumped for at least four hours and the water was found practically sterile, although no formaldehyde could be detected in the samples of water taken for examination, according to the report of the chemist member of the subcommittee.

Furthermore, new unused packing and washers, which up to the time of bacteriologic examination had not been handled (having been delivered for examination as originally wrapped), were also found to contain lactose fermenters.

Thus, it was believed that the source of the contamination of the well water by lactose fermenters was located and the insignificance of the contamination of the well water from a sanitary standpoint demonstrated. No attempt was made to identify or to group the lactose fermenters, but they could be readily differentiated from *B. coli* on eosin-methylene-blue lactose agar plates, forming large moist cupolated colonies with more or less pronounced black center, the colony frequently assuming a pinkish tinge. True *B. coli*-like colonies were never found to develop on the plates made from the well water. In order to obtain information as to the extent of distribution of lactose fermenters in nature, samples of dust from streets and sidewalks were examined, and grass and leaves of trees and shrubs were tested, and all, without exception, were found to harbor lactose fermenters.

In the following paragraphs, the results of tests on carbohydrate media performed with some of the lactose fermenters [1] collected from various plants in and around Manila are given.

Twenty strains of motile Gram-negative lactose fermenters were tested in various carbohydrate litmus agar media. The strains were isolated from the leaves of eighteen different plants, trees, bushes, and vegetables, both during the dry season and after a heavy rain. The collection includes samples of leaves from plants close to and far from human habitations.

All of the strains of these lactose fermenters fermented (acid and gas) besides lactose also glucose, levulose, mannite, rhamnose, galactose, maltose, xylose, arabinose, and raffinose. None of them in any way attacked inulin, and there was no gas production in amygdaline.

In saccharose 19 of the 20 produced acid and gas and only 1 of the 20 lactose fermenters did not attack saccharose.

In glycerine 10 out of 20 strains produced gas.

In salicine 19 out of 20 strains gave acid and gas and only 1 was negative.

In dulcite 9 out of 20 gave acid and gas.

In dextrin 9 out of 20 gave acid and gas; the rest were negative.

In sorbite 18 out of 20 gave acid and gas and 2 were negative.

In adonite 9 out of 20 gave acid and gas; the rest were negative.

[1] We received this collection from Dr. G. R. Lacy, of the International Health Board.

The second part of the investigation answers the question: Can *B. coli* of human fæces be differentiated from *B. coli* isolated from fæces of large and small animals living on land or in water?

COLLECTION OF SPECIMENS

Fresh stools from various large animals, including man, were collected in sterile glass receptacles. Specimens from fishes were obtained in the following way: The fish was placed for several minutes in a Petri dish containing a 2 per cent lysol solution; then it was washed three or four times in sterile water, to remove the lysol, and with sterile instruments the abdomen was opened. The intestine was cut out and the contents were inoculated in a lactose broth fermentation tube. From the last washing water, 0.1 cubic centimeter was taken up with a sterile pipette and planted in a fermentation tube so that no lactose fermenters might be transferred from the surface of the animal. The same procedure was followed with the water-living small animals listed below.

The frog's abdomen was disinfected with lysol solution, then opened with sterile scissors, the intestine was cut out, and the contents planted in a fermentation tube.

The water from the Bureau of Science pond, from which the fishes and most of the insects were collected, was collected directly from the pond in a sterile bottle.

Cultures from water insects belonging to Hemiptera and from a shrimp gave slow gas formation in lactose broth, but a negative reaction in lactose and glucose agar in twenty-four hours. Diptera and Coleoptera collected at the pond gave no gas in lactose broth.

ANIMALS UTILIZED IN THE EXPERIMENT

Mammals: Horse, carabao, goat, sheep, rabbit, guinea pig, white mouse, white rat.
Birds: Pet bird, rooster, owl.
Fishes: Mosquito fish.
Amphibia: Frog.
Water insects: Hemiptera, Coleoptera, Diptera.

PROCEDURE OF ISOLATION

Each specimen was inoculated into a lactose broth fermentation tube and incubated forty-eight hours; when gas was present, three dilutions of 1 : 5, 1 : 25, and 1 : 125 were made of the culture in sterile water and one loop of each dilution was

inoculated on a Teague's (methylene-blue-eosin lactose agar) plate. The plates were incubated for twenty-four hours. From each of these plates two black colonies, resembling *B. coli* colonies, were picked out and inoculated in glucose litmus agar, stab and slant, to note the production of gas and acid.

The various carbohydrate media used were in the form of litmus agar; they were melted and slanted (low slant), and then inoculated by stab and streak. Carbohydrates were added to litmus agar in 1 per cent concentration.

Twenty-four-hour-old cultures in acid agar and bouillon were used to determine the Gram staining and motility.

The Voges-Proskauer reaction was made as follows: Tubes containing 2 per cent glucose Dunham peptone solution were inoculated and incubated for three days; then 2 cubic centimeters of concentrated caustic potash solution were added to each tube and the whole exposed to light and air for twenty-four hours before the reaction was read.[2]

The lead acetate test was as follows: Ordinary broth tubes were inoculated and a lead acetate paper placed at the mouth of the tube; they were then incubated twenty-four hours and the reaction read.

RÉSUMÉ OF COMPARATIVE BIOLOGICAL TEST OF LACTOSE FERMENTERS ISOLATED FROM VARIOUS ANIMALS, INCLUDING MAN

1. All strains were motile and Gram-negative.
2. All strains blackened the lead acetate paper in twenty-four hours.
3. All strains acidified and coagulated milk (canned milk) in from three to seven days.
4. All strains gave gas in lactose broth.
5. All strains gave acid and gas in the following carbohydrates: Glucose, lactose, dulcite, maltose, mannite, galactose, xylose, arabinose, levulose, rhamnose, sorbite, and raffinose.
6. All strains were negative (no acid nor gas) in amygdaline and adonite.
7. Voges-Proskauer reaction, all strains were negative.
8. All strains produced acid and gas in saccharose except owl 2, white mouse 1 and 2, and rooster 2.
9. All strains gave acid in dextrin, except carabao 1 and 2 and frog 2, which gave acid and gas; and guinea pig 2, white

[2] Stitt, E. R., Practical Bacteriology, Blood Work, Parasitology. 7th ed. (1923) 36.

mouse 1, white rat 1 and 2, mosquito fish 2, owl 1 and 2, pet bird 1, and human 2, which gave no acid or gas.

10. All strains were negative in inosite, except mosquito fish 1 and 2, owl 1, and carabao 1 and 2, which gave acid.

11. All strains were negative in inulin, except frog 1, which gave acid.

12. All strains were negative in salicin, except goat 1, which gave acid; and guinea pig 1, mosquito fish 1 and 2, human 1 and 2, horse 2, goat 2, sheep 1 and 2, and carabao 1 and 2, which gave acid and gas.

13. In 5 per cent glycerine bouillon all strains were negative in twenty-four hours. In forty-eight hours, no strains gave gas, except owl 1 and 2 and bird 1 and 2. In seventy-two hours, all strains gave gas, except mosquito fish 1 and 2, rooster 2, human 2, horse 2, and carabao 1.

Strains from the Bureau of Science pond water gave the same reaction as the other strains, with the following differences:

Slight acidity in amygdaline, acid and gas in adonite and inosite. Discoloration of litmus in inulin, gas more than 5 per cent in twenty-four hours in 5 per cent glycerine bouillon.

Differences were encountered in the following carbohydrates:

Dextrin.—One human strain was negative, as were also strains from guinea pig, white mouse, white rat, fish, owl, and pet bird. Another human strain produced acid in dextrin, as did also the strains from rabbit, guinea pig, white mouse, fish, pet bird, rooster, horse, goat, sheep, carabao, and frog.

Inosite.—Both human strains were negative in inosite, as were also strains from rabbit, guinea pig, white mouse, white rat, owl, pet bird, rooster, horse, goat, sheep, and frog. One strain from fish, one from owl, and one from carabao produced acid, but no gas.

Inulin.—With the exception of one strain from frog, all strains, including human, were negative.

Salicin.—Both human strains gave acid and gas, as did also the strains from guinea pig, fish, horse, goat, sheep, and carabao.

In 5 per cent glycerine broth.—One human strain produced no gas, but strains from fish, rooster, horse, and carabao behaved the same way; another human strain gave gas in 5 per cent glycerine, as did also the strains from rabbit, guinea pig, white mouse, white rat, owl, pet bird, rooster, horse, goat, sheep, and frog.

Analyzing the results we find that there is no single carbohydrate, nor any group of them, which would enable us to

differentiate lactose fermenters giving a *B. coli*-like colony of human origin from those of animal origin. On the other hand, there is a distinct difference between all of the fæcal strains and the strain isolated from the experimental fish pond.

The water lactose fermenter differed from all of the animal strains in that it fermented glycerine within twenty-four hours, fermented adonite and inosite, and acidified amygdaline.

It can be seen that both human strains gave acid and gas in salicin, while some of the lactose fermenters of animal origin did not attack it. It was therefore considered necessary to test a series of lactose fermenters of human origin as to their behavior to salicin.

Of forty strains of lactose fermenters isolated from forty samples of human fæces, 10 per cent gave acid and gas in salicin in twenty-four hours, 20 per cent after forty-eight hours, and 22 per cent after seventy-two hours incubation, while 48 per cent were negative.

AGGLUTINATION TEST OF LACTOSE FERMENTERS OF HUMAN, ANIMAL, AND VEGETABLE ORIGIN WITH SERUM OBTAINED FROM RABBITS IMMUNIZED WITH HUMAN STRAIN OF B. COLI

Two rabbits were injected with gradually increasing doses of human *B. coli* (No. 1) emulsion in salt solution, previously killed by heat at 60° C. for one hour. Injections were made subcutaneously in the abdominal region, and were given every five days. The doses were: 0.1, 0.5, 1, 2 (loop) and 0.01, 0.1, 0.2, 0.5, 0.8, 1 (slant), emulsified in 1 or 2 cubic centimeters of salt solution.

Seven days after the last injection of 1 slant, 10 cubic centimeters of blood were withdrawn by heart puncture and the blood was placed in the incubator for a half hour and in the ice chest overnight and then centrifuged for ten minutes to separate the serum, which was used to make a macroscopic agglutination test with a culture of its homologous human *B. coli* (No. 1).

About 15 cubic centimeters of salt solution were added to one slant of a twenty-four-hour-old culture in agar of the corresponding *B. coli* and the growth was emulsified and placed in a sterile tube. In a series of twelve tubes, 1 cubic centimeter of the immune serum was placed, diluted in salt solution at 1 : 2, 1 : 4, 1 : 8, 1 : 16, 1 : 32, 1 : 64, 1 : 128, 1 : 256, 1 : 512, 1 : 1024, 1 : 2048, and 1 : 4096. To each tube 1 cubic centimeter of the *B. coli* emulsion was added. In an extra tube 1

cubic centimeter of salt solution plus 1 cubic centimeter of emulsion were placed as control. The tubes were incubated for two hours at 37° C. and for twenty-four hours at room temperature, in a dark place. The reading gave a positive agglutination up to the 1 : 64 dilution of the serum.

A microscopic agglutination test was made with this immune serum and a series of 40 strains of human *B. coli,* 14 animal strains, 27 strains of plant origin, and cultures of typhoid (paratyphoid "A" and "B") as controls. Twenty-four-hour-old broth cultures were used and agglutination made in 1 : 1 concentration; the reaction was read after the culture had been allowed to stand a half hour. The results were as follows: Of the 40 human strains, 33 gave complete agglutination, 2 were incomplete, and 5 negative; of the 14 animal strains, 13 were complete and 1 negative; of the 27 plant strains, 20 gave complete agglutination, 6 incomplete, and 1 negative. The typhoid and paratyphoid "A" cultures gave a slight agglutination and the paratyphoid "B" was negative.

The fallacy of the test for lactose fermenters as an indication of fæcal pollution is evident from the following conclusions:

1. Even though lactose fermenters others than true *B. coli* are frequently present in human and animal fæces, due to their wide distribution in nature and their presence in places where fæcal contamination is excluded, these bacteria as a group cannot be considered as an indication of fæcal contamination.

2. On the other hand, we are justified in considering true *B. coli* as an indicator of fæcal pollution, owing to its relatively limited distribution outside of the human and the animal body.

3. True *B. coli* can be fairly readily differentiated from the other members of the *coli* group by the type of its colony on eosin-methylene-blue lactose agar plate.

4. Comparative tests of *B. coli* strains failed to yield any criterion for the differentiation of *B. coli* of human origin from *B. coli* of animal origin.

5. Under natural conditions the pollution of water by *B. coli* originating from the fæces of water-living animals such as fishes, frogs, and insects is not likely.

EFFECTS OF CASTRATION ON IMMATURE GUINEA PIGS [1]

By MANUEL D. SUMULONG

Of the College of Veterinary Science, University of the Philippines, Los Baños, Laguna

FOUR TEXT FIGURES

INTRODUCTION

The experiment here reported was undertaken with the primary object of getting further information concerning the influence of castration on mammals, particularly with reference to growth in body weight, length, height, and circumference. While the number of animals employed in this study may not be sufficient from which to draw a definite conclusion, I believe the data here reported will prove of considerable value for further investigations along this line, not only with laboratory animals, but also with large domestic animals.

A systematic study of the effects of castration on mammals would lead to results of biological interest and might prove of economic importance also, in as much as castration of work animals is objected to by many people. Some entertain the idea that, if the animal is castrated before it has reached its full development, it will not acquire the size, conformation, and other characteristics that it should possess on reaching maturity; others are of the opinion that castration, whether performed before or after the age of maturity, decreases to some extent the physical strength and resistance of the animals. These beliefs, which have been handed down from father to son for generations, unquestionably have affected the live stock industry in the Philippines. The inferiority of our present types of animals can be attributed, in part at least, to the failure of our stock owners to improve the breeds by rendering the undesirable male animals incapable of procreation. No experimental evidence has been advanced as to the correctness of this opinion, so far as I know. Available records show that there has been no systematic study on the effects of castration

[1] Received for publication December 27, 1924.

on large domestic animals; that castration has been performed only for economic purposes.

SURVEY OF THE LITERATURE

Shattock and Seligmann,(18) in their experiments on young and immature common fowls and on the Herdwick breed of sheep, found that when the vasa deferentia were ligated the secondary sexual characteristics of the male bird acquired their full size, and that the sheep acquired horns and full-sized testicles comparable to those of the normal male. On the other hand, the results of a number of experiments and investigations by other authorities have demonstrated conclusively that when the sex glands are completely removed the secondary sexual characteristics undergo modification in their development in birds and in some mammals at least. The results of all experiments and investigations on this subject indicate clearly that the development of the sexual characteristics, especially the secondary ones, is controlled by some kind of internal secretion of the sexual glands which, according to many investigators, in the male animals is elaborated by the so-called interstitial cells of Leydig. The changes subsequent to the complete removal of the testicles, however, are much more conspicuous in birds than in mammals, and they are very well portrayed in the paper of Crew(2) on the effects of castration in fowls, in which he states, in part:

> Castration of the male before puberty—at the age of two to three months—results in a markedly poor development of the comb, wattles and ear appendages, remaining small, pallid and almost bloodless. The sex-instinct is not exhibited, and the capon is gentle, slow, quiet, peaceful and reserved. It does not interfere with hens and is not molested by cocks. It sometimes exhibits the brooding habit. The plumage and spurs are not affected by the operation save that the plumage is rather fuller and the feather rather longer as a consequence.
>
> Castration after puberty is immediately followed by suppression of sex-instinct, and the comb, wattles and ear appendages in the course of a few weeks lose all their vascularity, becoming bloodless and steadily diminishing in size. The plumage is not affected and the spurs continue to grow at the normal rate of two millimeters per month. Molting does not modify the type of plumage.

According to Pirsche(15) the body growth in chickens is accelerated after castration.

Of the available literature on castration of mammals the work of Fichera,(5) Marrassini,(11) and Marrassini and Luciani(12) deals primarily with the changes occurring in other

ductless glands after the removal of the male reproductive glands. Marshal(13) in his experiment on sheep concludes that—

> * * * the development of horns in the males of a breed of sheep in which well marked secondary sexual differentiation occurs (as manifested especially by presence or absence of horns) depends upon a stimulus arising in the testes, and this stimulus is essential not merely for the initiation of the horn growth but for its continuance, the horns ceasing to grow whenever the testes are removed.

Poncet(16) made a study of the influence of castration on the development of the skeleton in rabbits; he also records(17) some observations on the effects of the operation upon the skeleton of dogs. In all his experiments he observed that the limb bones become longer than normal after castration. So far as I know, Stotsenberg(19) and Hatai(6) are the only investigators that have carried out thorough and systematic studies on the effects of castration on the body growth in mammals, using white rats as their experimental animals. Launois and Roy(10) record some observations on the influence of castration on the body growth in guinea pigs. The literature on castration in human beings has been thoroughly reviewed by Stotsenberg.(19)

MATERIALS AND METHODS

For this experiment sixty-four guinea pigs representing twenty-nine litters were used; thirty-five of the pigs constituted the test animals, and the remaining twenty-nine the controls. In all cases both the castrated animal and its control were taken from the same litter. This precaution was observed in order to avoid or at least to minimize the variability of characters in different litters for, according to Jackson,(8) in white rats the variability is greater when individuals of different litters are compared. All the animals used in this experiment were raised by me and were under my direct supervision; they were so kept that frequent daily observations were made possible.

Although the animals were kept in a room having a temperature ranging from 22° to 28° C., which is very much higher than the temperature (60° to 70° F.) that Draper(4) found most suitable for guinea pigs, yet no inconvenience or undesirable effects on the animals was noted. They were fed on oats and young grass; plenty of fresh water was given to them every day, though they seemed to be able to get along without it when given a liberal supply of green stuff.

The young of the selected litters were weighed, measured, and numbered soon after the hair had dried; animals born at night were weighed, measured, and numbered on the following morning. The subsequent weights and measurements of the individual animals were taken at regular intervals of one, two, four, and eight weeks. In all instances both the castrate and its control were weighed and measured on the same day and during the same hour. It may be mentioned in this connection that, of the methods tried for numbering guinea pigs, the artificial notches and clefts made on the pinna or auricula of the external ear proved to be the most satisfactory.

Most of the animals intended for use as tests were castrated at the age of six weeks, at which time they and their respective controls were separated from their mothers. In litters having more than two males, only one was left as control. It has been my experience that in the majority of the cases, the removal of the testicles by scrotal incision at an age younger than six weeks is almost impossible, because prior to that age the glands are still held firmly within the abdominal cavity. Even at the age of six weeks the testes have not descended into the scrotal sacs, but in spite of this the operation is quite safe and practicable, as by this time, owing to the comparatively wide inguinal rings and canals of these animals, the sex glands can be gently squeezed into the scrotal sacs where they can be retained for further manipulation by exerting pressure against the region of the pubic brim.

Before the operation the hair in and around the scrotum was clipped and the area thoroughly washed and disinfected. Then with ether the animal was put under general anæsthesia. With the testes well retained within the scrotal sacs by means of the pressure exerted by the index finger of the operator's left hand against the brim of the pubis, a longitudinal incision at the most prominent point of each scrotal sac was made, and then each testis, together with its corresponding epididymis, was removed by torsion. The wounds were painted with a little tincture of iodine, and the animal was isolated for three days. This isolation was for the purpose of giving the animal the least possible disturbance so as to prevent hæmorrhage and to allow the wounds to heal as soon as possible. The isolation was found to be absolutely essential, otherwise the animals that had been operated upon were molested by other guinea pigs, due probably to the odor of the anæsthetic. It may be mentioned here that in the first three cases, when this precaution was not taken,

the scrotal wounds were licked by other animals to the extent that a loop of the intestine was caused to protrude through one of the incisions. After three days' isolation the castrated animal and its control were placed in the same run or inclosure where they both received similar treatment and care.

RESULTS OF THE EXPERIMENT

The changes in growth of the different parts of the body of castrated guinea pigs are so limited and harmonious that there is no apparent modification of the general body conformation as a consequence of the operation. It may be mentioned in this connection, however, that in about 40 per cent of the cases the hair appeared somewhat fuller and longer than that of the control. In general most of the secondary sexual characteristics remained rather undeveloped, and the general disposition of the castrated animals was very markedly changed.

For the sake of economy in space the records of the actual weights and measurements of each individual animal are not included in this paper; only the average weights and measurements of the castrated animals and their respective controls at different ages are given, in Tables 1, 3, 4, and 5, from which were plotted the graphs in figs. 1, 2, 3, and 4.

To test the question as to whether the lengths and weights of the long bones of the limbs are affected by castration, as is claimed by the majority of the previous investigators consulted, the actual measurements and weights of the left humerus, radius, femur, and tibia of each individual animal of the same twenty litters were carefully and accurately taken; the data obtained thereby are reported in Tables 8 and 9. In Table 6 are given the average weights and average percentages of the individual organs of the same animals.

The details of the results of this experiment, based upon the data given in the different tables and figures referred to above, will be taken up in the discussion of the individual topics.

DISCUSSION OF RESULTS

EXTERNAL APPEARANCE, GENERAL DISPOSITION, AND SECONDARY SEXUAL ORGANS

My clinical observation has been that castration, when performed on young and immature carabaos, modifies very markedly the development of the neck; it is lighter in weight and rather slender, instead of becoming broad, massive, and heavy as in the uncastrated animal. This is the reason, many carabao owners say, why they object to having their animals

castrated before they have become fully grown; they desire to have the neck developed with the natural qualities so as to get the best fitting for the yoke and, according to some, the proper strength. In horses it is the observation of Hayes(7) that geldings have comparatively lighter necks and, owing to this, as in the case of mares, the union of the neck with the head and trunk is better marked than in those that are entire. Practical stockmen claim that castration is followed by the development of more refined and graceful head and legs in horses. The above observations and assertions, however, do not apply to guinea pigs; for, so far as I was able to observe, the head, neck, and body, as well as the legs of the castrated animals presented no obvious modification.

In the light of the present findings based upon the data which will be alluded to later, it seems that the general characteristic body conformation of these animals is not appreciably altered by castration; in other words, the normal relation between the different parts remains apparently unaffected by the operation. The exceedingly enlarged paws observed by Launois and Roy(10) in their castrated guinea pigs were not noted in the castrated animals in this experiment. The development of somewhat fuller and longer hair in about 40 per cent of the castrated guinea pigs is not considered here as incident to the operation, although this finding coincides with the observation of Crew(2) in the fowl, that castration is followed by the development of rather fuller plumage and longer feathers.

The general disposition of the castrated guinea pigs was very much changed. They assumed something of the temperament of the female; that fighting spirit, which is characteristic of the full male animal and which is especially manifested in the presence of strange females, disappeared almost entirely in the castrated animals. In only a very few instances the castrates were noted to have provoked fighting; they became nonaggressive and if they fought at all it was only for a short time. The impelling impulses for sexual intercourse were mostly, if not wholly, done away with by the operation. A very few of the castrated animals were noted to have retained some symptoms of sexual desire, which consist, when exhibited, in the emission of the peculiar and characteristic sound (*krok-krok-krr-rr-rr-krok-krok-rr-rr*) of the male animals in the presence of the females and the smelling of the vulva. In no instance were the castrated animals seen to mount other animals for the purpose of sexual intercourse. On the contrary, many times

they were mistaken for females by their controls, which mounted and interfered with them very frequently. Examination of the penis of those castrated animals that still showed some sexual instinct proved that no erection of the organ occurred at the time of the exhibition of sexual symptoms. On the whole, most of the above findings agree with my personal observation and with those of Dollar,(3) Merillat,(14) and Thompson(20) on large domestic animals.

Of the secondary sexual organs only the scrotum was observed to be markedly affected by castration; it remained absolutely undeveloped. Contrary to the finding of Launois and Roy(10) that the penis of their castrated guinea pigs remained undeveloped, it was observed in this experiment that the penis of the castrated animal appeared only slightly smaller than that of the control. This finding indicates that castration does not interfere with the growth and development of the penis, but, probably because of the functional disturbance in this organ, the natural size that it should possess is not acquired. The prepuce appeared somewhat tight. The teats or nipples were somewhat smaller than those of the controls; the base of each mammary gland, however, felt much more extensive and somewhat firmer in consistency than that of the controls. Dissection of the glands proved that this condition was due to the presence of a rather large and well-organized lobe of adipose tissue in the glands themselves and in the subcutaneous tissue extending from the base of each gland to the inguinal region.

THE GROWTH IN BODY WEIGHT

Whether the removal of the testes from the body of young mammals is followed by an acceleration of growth in body weight is still an open question. The results of the experiments with common fowls seem to demonstrate conclusively that there is an acceleration in growth in body weight after castration. In white rats and guinea pigs, on the other hand, the results of the previous experiments are so contradictory that it is not possible to interpret the effect of the operation on the growth in body weight in these animals in a satisfactory manner. Experimenting on three guinea pigs from the same litter, two castrated and one control, for a period of eight months, or thirty-two weeks, Launois and Roy(10) found that in one case the castrated animal was 150 grams heavier than the control at the end of four months, and another was 30 grams heavier than the control after the same period. They fur-

ther observed that for the next four months the weights of both the castrated and the control animals did not alter materially. In white rats, on the contrary, the finding of Stotsenberg,(19) which was fully supported by that of Hatai,(6) was that the growth in body weight is not influenced at all by castration.

TABLE 1.—*Average weights of the castrated and control guinea pigs at different ages.*

Age.	Castrated cases.	Weight.	Excess in favor of—		Weight.	Control cases.
			Castrated.	Control.		
Weeks.		*g.*	*g.*	*g.*	*g.*	
At birth	35	78.9	----------	4.7	83.6	29
4	35	198.7	----------	4.9	203.6	29
8	35	298.4	----------	2.8	301.2	29
12	32	407.5	----------	3.3	410.8	26
16	32	499.4	13.0	----------	486.4	26
20	28	571.5	----------	12.4	583.9	23
24	26	623.1	10.5	----------	612.6	21
28	25	672.6	15.9	----------	656.7	20
32	24	753.2	50.2	----------	703.0	19
36	23	767.5	25.5	----------	742.0	18
40	23	789.2	20.9	----------	768.3	18
44	18	803.7	19.0	----------	784.7	14
48	15	810.4	14.3	----------	796.1	11
52	12	820.7	18.7	----------	802.0	8
56	5	810.3	15.1	----------	795.2	4

By referring to Table 1 it will be noted that the average weight at birth of the castrated animals was 78.9 grams, in contrast with 83.6 grams for the controls, and that the controls continued to lead in weight up to the age of twelve weeks, or about six weeks after the test animals were operated upon. At the sixteenth week, however, the castrates surpassed the controls, but at the twentieth week the controls attained almost the same weight. This condition evidently shows that there was, from the age of twelve to twenty weeks, a rather irregular increase in weight in both the castrated and the control animals. This irregularity may have been brought about by merely incidental influences.

Another thing that will be noticed from Table 1 is that the average weights of the castrated animals, starting from the age of twenty-four weeks, are always more than those of the controls, the maximum and minimum excesses being 50.5 and 10.5 grams, respectively. By taking the average of the excesses from the age of twenty-four to fifty-six weeks, it will be found

that the castrates are on an average 23.7 grams heavier than the controls at the end of every four-week interval.

In fig. 1 are shown the growth curves in body weight of the castrated and the control animals as plotted from the data in Table 1. It will be noted from this figure that, up to the age of twelve weeks, the curves run almost parallel, but between

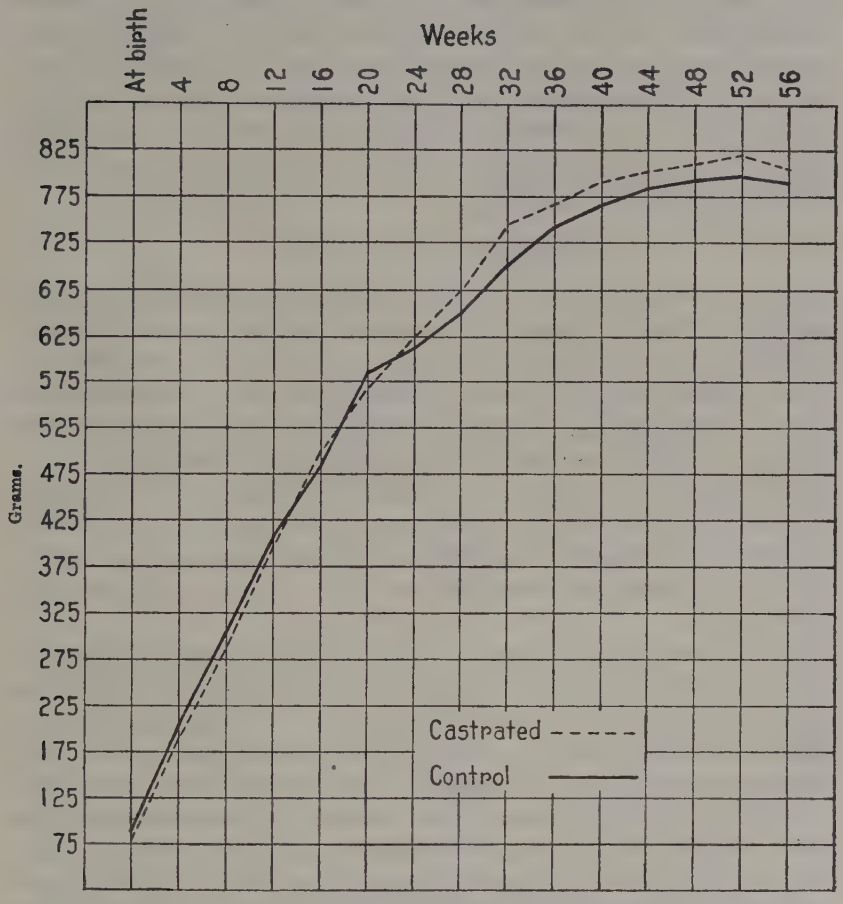


FIG. 1. Showing the curves of growth in body weight of the castrates and the controls as plotted from data in Table 1.

this age and the age of twenty-four weeks they intersect. Although the curve for the castrated animals begins to part company with that of the controls at the twenty-fourth week, yet it will be noted that from this time on its course is fairly regular in character and does not materially differ from that of the controls.

The foregoing data, together with the nature of the curves, indicate that castration in young and immature guinea pigs does

accelerate to a limited extent the growth of the body in weight. The acceleration, however, does not immediately follow the operation, but begins to be manifest about the sixteenth week after the operation, or in other words at about the age of twenty-two weeks. According to Lantz,(9) the age of maturity in guinea pigs is about four or five months. If this age of maturity is applicable in the present series, it seems that the acceleration of growth in body weight as a consequence of castration commences only after the age of maturity has been reached. Furthermore, the acceleration is fairly regular in nature and so moderate that the growth curve of the castrates does not depart markedly from the general course of the growth curve characteristic for the full animals.

THE GROWTH IN BODY LENGTH

In the works consulted on the effects of castration in guinea pigs and other mammals, no mention is made as to whether growth in body length is affected or not by the complete removal of the testes. It may be mentioned here, however, that in white rats, Hatai(6) observed that the normal relation between the body weight and the body length characteristic for his series remained unaltered in castrated animals. He further observed that the growth in body weight in these animals (white rats) is not modified by castration. It appears from this finding that Hatai noted no alteration at all of the growth in body length.

In the present investigation the term "body length" signifies the distance from the base of the head to the level of the joint formed by the second and third coccygeal vertebræ, the measurement being taken with the animal fully extended by an assistant. In order to find out the possible errors that might have been brought about by this method of taking the measurement, the actual lengths of the vertebral columns of twenty-five castrated and twenty control animals, representing twenty litters, were accurately determined after they had been sacrificed and their vertebral columns dissected and exposed. The data obtained are given in Table 2; they represent the length of the vertebral columns measured from the center of the nuchal or occipital surface of the skull, midway between the nuchal crest and the foramen magnum, to the articulation formed by the second and third coccygeal vertebræ. In case of more than one castrate in a litter only the average length is given in the table. Actual

measurement of the vertebral columns proved that the method employed here in taking the body length is accurate enough; the observed average body length of animals from twenty-four to fifty-six weeks old is 209 millimeters for the castrates and 207 for the controls, as compared with 210 and 206, average vertebral lengths for the castrates and controls, respectively. It will be noted from Table 2 that the vertebral columns of the castrated animals in 75 per cent of the litters are slightly longer than those of the controls. Taking the average length of the vertebral columns as the basis, it is found that the percentage of excess in favor of the castrated animals is 1.9.

TABLE 2.—*Actual lengths of the vertebral columns of the castrated and control guinea pigs and the percentages of excess.*

Litter.	Castrated.	Excess in favor of—				Control.
		Castrated.	Control.	Castrated.	Control.	
	mm.	*mm.*	*mm.*	*Per cent.*	*Per cent.*	*mm.*
1	210	5		2.50		205
2	206	1		0.47		205
3	225	8		3.67		217
4	205					205
5	209	9		4.50		200
6	216	8		3.84		208
7	203	3		1.50		200
8	217	7		3.33		210
9	210	5		2.50		205
10	205	2		0.98		203
11	210		5		2.47	215
12	200					200
13	220	8		3.77		212
14	215	10		4.92		205
15	210	10		5.00		200
16	205		5		2.44	210
17	215	15		7.50		200
18	208		7		3.36	215
19	205	5		2.50		200
20	215	5		2.38		210
Average	210	4		1.94		206

By comparing the observed average body lengths of the castrates and their controls at different ages, as given in Table 3, it will be noted that in the majority of the cases the body lengths of the castrated animals are slightly greater than those of their corresponding controls. The post-operative excess in favor of the castrates begins at the age of twelve weeks. The similarity of the post-operative lengths of the castrates and their controls

at the age of eight weeks seems to indicate that the operation does not produce immediate constitutional disturbances severe enough to retard or otherwise affect the growth in body length.

TABLE 3.—*Average body lengths of the castrated and control guinea pigs at different ages.*

Age.	Castrated cases.	Length.	Excess in favor of—		Length.	Control cases.
			Castrated.	Control.		
Weeks.		*mm.*	*mm.*	*mm.*	*mm.*	
At birth	35	96			96	29
4	35	137	2		135	29
8	35	160			160	29
12	32	181	2		179	26
16	32	194	2		192	26
20	28	200	2		198	23
24	26	202	1		201	21
28	25	203			203	20
32	24	204			204	19
36	23	208	3		205	18
40	23	211	4		207	18
44	18	211	3		208	14
48	15	211	2		209	11
52	12	212	1		211	8
56	5	215	2		213	4

From the data given in Tables 2 and 3 the conclusion can be safely drawn that castration causes a moderate acceleration of growth in body length in guinea pigs after they have reached a certain age. The acceleration of growth in body length is fairly regular and so mild that the type of growth curve in body length of the castrated animals presents hardly any significant difference from that of the controls, as will be seen in fig. 2. It is interesting to note in this connection that the increase of growth in body length is proportional to that of growth in body weight and that the normal relation between the body length and the body weight characteristic for the series is scarcely modified by the operation. Taking the observed average body length as the basis for computation, in castrated guinea pigs it is 364.2 per cent, and in the controls 357.5 per cent.

THE GROWTH IN HEIGHT AND BODY CIRCUMFERENCE

The term "height" here refers to the distance from the level of the posterior or dorsal angle of the scapula to the tip of the middle digit (excluding the claw), the measurement being taken

with the limb fully extended; and the term "body circumference" means the circumference of the trunk taken immediately behind the level of the angle of the scapula. This point was selected for taking the body circumference as it is not subject to much fluctuation arising from the condition of the stomach and intestines.

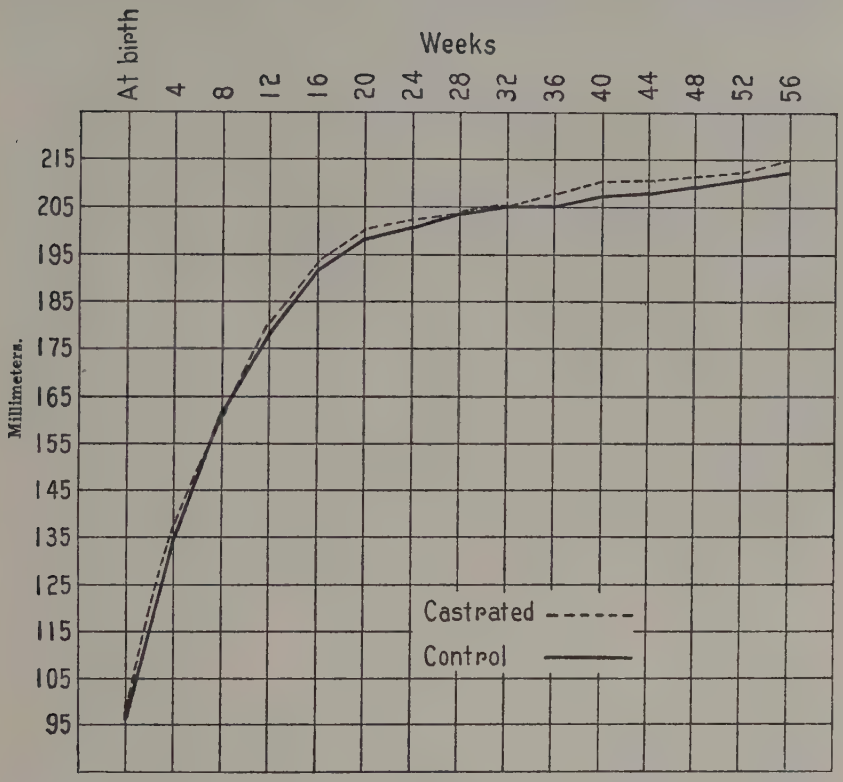


FIG. 2. Showing the curves of growth in body length of the castrates and the controls as plotted from data in Table 3.

I was unable to find records of any attempt to find out what influence castration has upon the actual height and body circumference of the animals. Most of the investigators consulted claim that castration, when performed in early life and before sexual maturity has been reached, is followed by a change in general body conformation, and that the bones of the castrated animals, such as guinea pigs, oxen, rabbits, dogs, and chickens, become longer than normal. If this is the effect of castration on the long bones, as a natural result the castrated animals will

become taller than the non-castrated or those that are entire, in as much as the height of an individual depends largely, if not wholly, upon the length of the long bones of the limbs.

Table 4 gives the average heights of the castrated animals and controls at different ages; it will be noted from this table that at birth the controls are 8 millimeters higher than the castrates, but after the age of eight weeks, or about two weeks after the

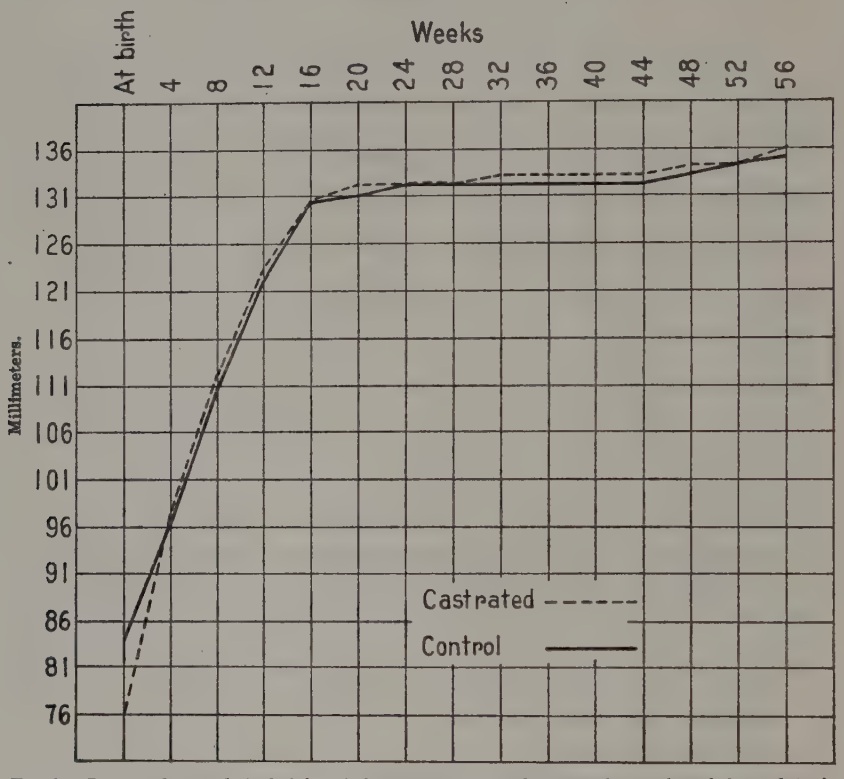


FIG. 3. Curves of growth in height of the castrates and the controls as plotted from data in Table 4.

operation, the castrated animals slightly exceed the controls in height. The similarity in height of the castrates and the controls at certain ages, for which merely incidental influences may account, appears to bear no particular significance in the interpretation of the results of this part of the experiment. As will be noted from fig. 3 the growth curves in height of the castrated and the control animals present no striking dissimilarity.

Examination of the data in Table 5 will show that the castrated guinea pigs after the age of twenty weeks, or about

fourteen weeks after they were operated upon, slightly exceed their controls in body circumference. Despite the similarity of the body circumference of the castrates and controls at the ages of forty and forty-four weeks, as will be noted from Table 5, the castrated animals record an average of 2 millimeters every four weeks. The character of the growth curve in body circumference of the castrated animals, in spite of slight irregularity of body growth, does not differ very much from that of the controls, as illustrated in fig. 4.

TABLE 4.—*Average heights of the castrated and control guinea pigs at different ages.*

Age.	Castrated cases.	Height.	Excess in favor of—		Height.	Control cases.
			Castrated.	Control.		
Weeks.		*mm.*	*mm.*	*mm.*	*mm.*	
At birth	35	76	----------	8	84	29
4	35	97	----------	----------	97	29
8	35	112	1	----------	111	29
12	32	124	1	----------	123	26
16	32	130	----------	----------	130	26
20	28	132	1	----------	131	23
24	26	132	----------	----------	132	21
28	25	132	----------	----------	132	20
32	24	133	1	----------	132	19
36	23	133	1	----------	132	18
40	23	133	1	----------	132	18
44	18	133	1	----------	132	14
48	15	134	1	----------	133	11
52	12	134	----------	----------	134	8
56	5	136	1	----------	135	4

The data given in Tables 4 and 5 show that castration in young and immature guinea pigs causes a slight acceleration in growth in height and body circumference. It may be noted in this connection that this acceleration is proportional to that of the growth in body length, as evidenced by the fact that the normal relation between the body length and height and body circumference is not materially affected. Taking the observed body length as the basis for computation,[1] the height of castrated animals is 63.78 per cent as compared with 64.08 per cent for the controls, and the body circumference of the castrated animals is 86.02 per cent in contrast with 86.47 per cent for the controls.

[1] In computing the percentage relation between the body length, body weight, height, and body circumference, only the records of animals from twenty-four to fifty-six weeks old were used.

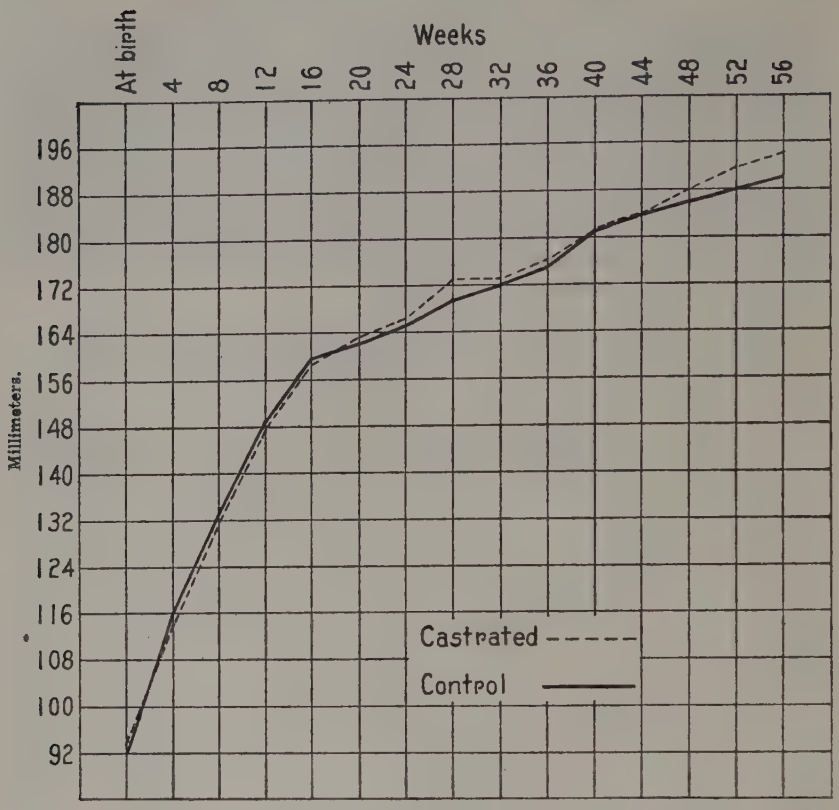


FIG. 4. Curves of growth in body circumference of the castrates and the controls as plotted from data in Table 5.

TABLE 5.—*Average body circumferences of the castrated and control guinea pigs at different ages.*

Age.	Castrated cases.	Body circumference.	Excess in favor of—		Body circumference.	Control cases.
			Castrated.	Control.		
Weeks.		*mm.*	*mm.*	*mm.*	*mm.*	
At birth	35	93	1		92	29
4	35	115		1	116	29
8	35	132		1	133	29
12	32	148		1	149	26
16	32	158		1	159	26
20	28	163	1		162	23
24	26	166	1		165	21
28	25	173	4		169	20
32	24	173	1		172	19
36	23	177	1		176	18
40	23	181			181	18
44	18	184			184	14
48	15	188	2		186	11
52	12	192	4		188	8
56	5	194	4		190	4

THE AMOUNT AND DISTRIBUTION OF FAT AND THE INTERNAL ORGANS

The bodies of the castrated and the control animals from twenty litters were dissected and examined for the comparative amount and distribution of fat. The internal organs were removed one by one, freed from fat and other adhering connective tissues, and their respective weights determined. Care was observed to prevent, as much as possible, the organs from drying. For the removal of the organs from their attachments in the body walls the following order proved to be the most satisfactory: Liver, spleen, pancreas, stomach, small intestine, large intestine, kidneys, adrenals, lungs, and heart. It may be stated here that the contents of the stomach and intestines were carefully and gently removed, using no water, before the organs were weighed; the lungs were cut at the bifurcation of the trachea; and the pericardium was not included in the weighing of the heart.

With the exception of the presence in the castrated animals of a large and apparently well-organized lobe of fat in each mammary gland and in the subcutaneous tissue extending from the base of each gland to the inguinal region, the amount and general distribution of fat in the body of the castrates were practically the same as in the case of the controls. This finding agrees for the most part with that of Launois and Roy,(10) but is contrary to the general conception that castration is followed by excessive deposition of fat. The observation of Brumley(1) on dogs may hold true also in guinea pigs, "that there is not the tendency to obesity when castration is performed at an early age."

The figures in Table 6 represent the average weights of the various internal organs of the sacrificed twenty-five castrated and twenty control animals from twenty litters. The percentage of the individual organ was computed by dividing the average weight of the organ by the average of the weights of the castrates or controls at the time they were killed. By referring to the average weights and percentages of the individual organs given in Table 6 it will be noted that the data for the castrates and for controls are practically identical. Thus, it appears that the weights of the various internal organs in guinea pigs and the percentage of the individual organ characteristic for the series are not modified by castration.

TABLE 6.—*Average weights and average percentages of the individual organs of guinea pigs.*

Organ.	Castrated.		Control.	
	Average weight.	Percentage.	Average weight.	Percentage.
	g.		*g.*	
Liver	33.96	4.182	33.62	4.134
Spleen	1.01	0.123	1.13	0.138
Pancreas	1.53	0.187	1.52	0.186
Stomach	5.47	0.669	5.61	0.689
Small intestine	13.34	1.633	13.29	1.634
Large intestine	16.35	2.002	18.12	2.228
Right kidney	2.13	0.260	2.12	0.260
Left kidney	2.09	0.255	2.18	0.267
Right adrenal	0.308	0.037	0.3	0.036
Left adrenal	0.308	0.037	0.302	0.037
Heart	2.74	0.335	2.76	0.340
Lungs	6.26	0.766	6.55	0.806

THE LONG BONES OF THE LIMB

In Table 8 are given the actual lengths of the left humerus, radius, femur, and tibia of castrated and control animals in twenty litters; the same bones were used in getting the data for Table 9. In litters where there were two or more castrates, as in litters 1, 2, 5, and 15, only the averages of the lengths and of the weights of their long bones are given in the tables. It will be noted in Table 8 that in 60 per cent of the litters the castrated animals have longer bones than the controls. The excess, however, is neither uniform for the different bones of the same animal nor for the same bone in different animals. In this table the percentage of excess was computed by dividing the excess (difference) by the length of the bone of the control. Computing from the average length of the bones of castrated and control guinea pigs, the percentage of excess of the bones of the castrated animals was found to be as follows: Humerus, 2.8; radius, 3.2; femur, 2.4; and tibia, 2.2. For comparison, the percentage of excess in length of some bones in chickens, guinea pigs, and dogs, as noted by former observers, is presented in Table 7.

Table 9 shows that in 65 per cent of the litters the bones of the castrated animals are slightly heavier than those of their controls. By comparing the data in Table 8 with those in Table 9, it will be noted that, with the exception of litter 7, the animals having longer bones are also the ones that are affected here. This condition seems to suggest that increase in length of the

bones in castrated animals is accompanied by a corresponding increase in weight. In this experiment no attempt was made to determine the thickness of the bones of castrated animals which, according to Launois and Roy,(10) is also increased by castration. It will be further noted from Table 9 that the percentages of excess in weight are neither uniform in the different bones of the same individual nor in the same bone of different animals. The table also shows that the percentages of excess in weight of the long bones of the castrated guinea pigs are as follows: Humerus, 16.8; radius and ulna, 29.8; femur, 10.9; and tibia, 10.1.

TABLE 7.—*Percentages of excess in length of some bones in animals, as noted by various observers.*

Author.	Animal.	Femur.	Tibia.
		Per cent.	*Per cent.*
Pirsche	Capon A	9	12.6
Do	Capon B	12	8.2
Launois and Roy	Guinea pig 1		
Do	Guinea pig 2		
Poncet	Castrated dog	21.4	12.0

Author.	Right femur.	Left femur.	Right tibia.	Left tibia.	Right humerus.	Left humerus
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Pirsche						
Do						
Launois and Roy	5.6	6.8	6.4	7.5	2.6	2.6
Do	7.9	6.8	8.6	8.0	7.0	9.0
Poncet						

SUMMARY AND CONCLUSIONS

1. Castration of young and growing guinea pigs not only develops the attitude and temperament peculiar to the females, but it also removes that restlessness ascribed to the impelling impulses for sexual intercourse.

2. With the exception of the penis, which appears to be somewhat undersized, all the secondary sexual organs in general remain infantile in type after castration.

3. Castration tends to cause a moderate acceleration of growth in body weight, body length, height, and body circumference. The acceleration, however, in these directions does not occur simultaneously nor immediately after the operation; it appears that the increase in body length and height begins to manifest

TABLE 8.—*Actual lengths of the long bones of castrated and control guinea pigs and the percentages of excess.*

Litter.	Humerus.			Radius.			Femur.			Tibia.		
	Castrated.	Control.	Excess.	Castrated.	Control.	Excess.	Castrated.	Control.	Excess.	Castrated.	Control.	Excess.
	mm.	*mm.*	*Per cent.*	*mm.*	*mm.*	*Per cent.*	*mm.*	*mm.*	*Per cent.*	*mm.*	*mm.*	*Per cent.*
1	36	35	2.8	32	31	3.2	42	41	2.4	48	47	2.1
2	36	36		32	32		42	42		46	46	
3	37	36	2.7	33	32	3.1	43	42	2.3	48	47	2.1
4	35	34	2.9	32	31	3.2	40	39	2.5	45	44	2.2
5	37	36	2.7	33	31	6.4	43	40	7.5	48	45	6.6
6	37	34	8.8	33	31	6.4	43	41	4.8	47	45	4.4
7	36	36		32	32		43	43		47	47	
8	37	36	2.7	32	31	3.2	43	41	4.8	48	46	4.3
9	35	35		32	32		42	42		46	46	
10	36	36		32	32		42	42		46	46	
11	37	35	5.7	34	32	6.2	43	41	4.8	49	46	6.5
12	33	33		30	30		40	40		44	44	
13	36	36		33	33		42	42		47	47	
14	37	34	8.8	34	31	9.6	42	40	5.	48	45	6.6
15	36	35	2.8	33	32	3.1	43	42	2.3	48	47	2.1
16	35	35		32	32		41	41		45	45	
17	36	36		32	32		41	41		45	45	
18	38	37	2.7	34	33	3	44	43	2.3	49	47	4.2
19	35	34	2.9	32	31	3.2	42	41	2.4	46	44	4.5
20	38	37	2.7	34	33	3.	45	44	2.2	48	47	2.1
Average	36	35	2.8	32	31	3.2	42	41	2.4	47	46	2.2

TABLE 9.—*Weights of the long bones of the limbs of castrated and control guinea pigs and the percentages of excess.*

Litter.	Humerus.			Radius and ulna.			Femur.			Tibia.		
	Castrated.	Control.	Excess.	Castrated.	Control.	Excess.	Castrated.	Control.	Excess.	Castrated.	Control.	Excess.
	cg.	*cg.*	*Per cent.*	*cg.*	*cg.*	*Per cent.*	*cg.*	*cg.*	*Per cent.*	*cg.*	*cg.*	*Per cent.*
1	80	70	14.2	60	50	20	160	130	23	110	90	22.2
2	80	80	----------	60	60	----------	130	130	----------	80	80	----------
3	80	70	14.2	60	50	20	140	120	16.6	100	90	11.1
4	90	80	12.5	70	60	16.5	150	120	25	90	70	28.5
5	90	80	12.5	60	50	20	160	130	23	100	90	11.1
6	100	70	42.8	70	50	28.5	140	120	16.6	100	90	11.1
7	80	70	14.2	60	50	20	140	120	16.6	100	90	11.1
8	100	80	25	70	60	16.6	150	130	15.3	100	90	11.1
9	80	80	----------	60	60	----------	130	130	----------	90	90	----------
10	80	80	----------	60	60	----------	130	130	----------	90	90	----------
11	80	70	14.2	70	60	16.6	140	130	7.6	100	90	11.1
12	60	60	----------	50	50	----------	120	100	20	90	80	12.5
13	80	80	----------	60	60	----------	130	130	----------	100	100	----------
14	90	80	12.5	70	60	16.6	140	130	7.6	100	90	11.1
15	80	70	14.2	70	60	16.6	140	130	7.6	100	90	11.1
16	90	90	----------	60	60	----------	140	140	----------	90	90	----------
17	80	80	----------	60	60	----------	120	120	----------	90	90	----------
18	90	80	12.5	70	60	16.6	150	140	7.1	130	100	30
19	80	70	14.2	60	50	20	150	120	25	90	80	12.5
20	100	90	11.1	70	60	16.6	180	160	12.5	100	90	11.1
Average	80	77	16.8	64	57	29.8	142	128	10.9	98	89	10.1

itself only when the castrated animal is approaching the age of maturity, and the increase in body weight and body circumference only when it has reached or passed the age of maturity. The explanation of this condition that can at present be offered is that probably the formative energy in the body of the animal before the age of maturity is mostly directed toward the development of the framework or harder structures of the animal body, and only after this framework has been developed to a certain stage does the formative energy become proportionally divided among the hard and soft constituents of the body for their further growth and development.

4. The acceleration of growth of the different parts of the body after the age of maturity is fairly regular and harmonious, so that their normal relation is hardly affected; in other words, the general body conformation characteristic for a certain individual remains practically unmodified after castration.

5. The acceleration of body growth incident to castration does not materially alter the normal types of growth curves in body weight, body length, height, and body circumference.

6. The weights of the internal organs and the deposition of fat in the body are not influenced by castration in young and immature animals.

7. The vertebral column and the long bones of the limbs, besides being somewhat heavier, tend to grow slightly longer than normal after castration.

LITERATURE CITED

1. BRUMLEY, OSUR VICTOR. A textbook of the Diseases of the Small Domestic Animals (1921) 636 pp.
2. CREW, F. A. E. The effect of castration in the fowl. Veterinary Journ. 78 (1922) 27–30.
3. DOLLAR, JNO. A. W. Regional Veterinary Surgery and Operative Technique. London, Gay & Hancock, Ltd. (1920) 1114 pp.
4. DRAPER, R. L. The prenatal growth of the guinea-pig. Anat. Rec. 18 (1920) 369–392.
5. FICHERA, G. Sur l'hypertrophie de la glande pituitaire consécutive á la castrazione. Arch. Ital. Biol. 43 (1905) 405–426.
6. HATAI, SHINKISHI. The effect of castration, spaying or semi-spaying on the weights of the central nervous system and of the hypophysis of the albino rat; also the effect of semi-spaying on the remaining ovary. Journ. Exp. Zool. 15 (1913) 297–314.
7. HAYES, M. HORACE. Points of the Horse. 4th ed. (1903) 736 pp.
8. JACKSON, C. M. Postnatal growth and variability of the body and of the various organs in the albino rat. Am. Journ. Anat. 15 (1913) 1.

9. LANTZ, DAVID E. Raising guinea-pigs. U. S. Dept. Agr. Farmers' Bull. 525 (1913) 1–12.
10. LAUNOIS, P. E. and PIERRE ROY. Etudes Biologiques sur les Géouts. Paris, 1904. Cited by Hobday. See Ref. 18.
11. MARRASSINI, A. Sur les modifications que la castration peut determiner dans les organes glandulaires de quelques animaux, et specialment sur celles que l'on recontre dans l'hypophyse. Arch. Ital. Biol. 53 (1910) 419–431.
12. MARRASSINI A. and L. LUCIANI. Effets de la castration sur l'hypophyse et sur d'autres glandulaires. Arch. Ital. Biol. 56 (1911) 395–432.
13. MARSHAL, F. H. A. On the effects of castration and ovariotomy upon sheep. Proc. Roy. Soc. B. 85 (1912).
14. MERILLAT, LOUIS A. Veterinary Surgical Operations. 2d ed. 3 (1918) 556.
15. PIRSCHE, E. De l'influence de la castration sur le développement du squelette. Cited by Hobday. See Ref. 18.
16. PONCET. Cited in Stotsenberg. See Ref. 19.
17. PONCET. Congrès de l'Association Francaise pour l'Avancement des Sciences. Havre (1877). Cited by Hobday. See Ref. 18.
18. SHATTOCK, S. G. and C. G. SELIGMANN. Trans. Path. Soc. London 56 (1905) 57. Cited by Hobday. Castration and Ovariotomy, Edinburgh and London (1914) 160 pp.
19. STOTSENBERG, J. M. On the growth of the albino rat after castration. Anat. Rec. 3 (1909) 233.
20. THOMPSON, HENRY. Elementary Lectures on Veterinary Science. 4th ed. (1920) 524.

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. Diagram showing the curves of growth in body weight of the castrated and control guinea pigs as plotted from data in Table 1.
2. Diagram showing the curves of growth in body length of the castrated and control guinea pigs as plotted from data in Table 3.
3. Diagram showing the curves of growth in height of the castrated and control guinea pigs as plotted from data in Table 4.
4. Diagram showing the curves of growth in body circumference of the castrated and control guinea pigs as plotted from data in Table 5.

ECHINOCOCCUS CYST OF THE HUMAN LUNG

By WALFRIDO DE LEON and LAMBERTO LEIVA

Of the Laboratories of Pathology and Parasitology, College of Medicine, University of the Philippines

NINE PLATES AND THREE TEXT FIGURES

CONTENTS

INTRODUCTION.
CLINICAL HISTORY OF THE PATIENT.
NECROPSY FINDINGS AND ANATOMIC DIAGNOSIS.
STUDY OF THE HYDATID CYST.
Gross examination.
Microscopic study of the material and discussion as to manner of formation.
Whole brood capsule.
Sections of the cyst and its contents.
Cyst wall.
STUDY OF THE HYDATID CYST—Ctd.
Microscopic study, etc.—Ctd.
Sections of the cyst and its contents—Continued.
Brood capsules.
Scoleces.
Rostellum and suckers.
LIFE HISTORY OF THE PARASITE.
INCIDENCE.
PATHOGENESIS.
DIAGNOSIS.
PROPHYLAXIS AND TREATMENT.
REFERENCES.

INTRODUCTION

Although one not infrequently meets with *Taenia* infestation of the intestine of both man and the lower animals, yet no report has heretofore been made in the Philippines of the occurrence of the larval stage of any cestode in the lung of a human being. Strong(15) recorded two cases of echinococcus cyst, one in the liver and the other in the omentum, observed at autopsy; and Garrison(8) learned from inquiry that another case had occurred in Manila. He stated, however, that the reports on this and Strong's cases were verbal and that no specimens appear to have been preserved.

Castellani and Chalmers,(4) without giving any specific reference to Philippine literature, briefly mention that hydatid disease is known in the Philippine Islands. Crowell and Hammack(5) found a case of extensive infestation with *Cysticercus cellulosæ* (Gmelin) among 500 autopsies, but none of echinococcus. Wharton,(16) apparently referring to the accounts of Strong and of Garrison, reports infestation of man with *Echinococcus granulosus* (Batsch) Rudolphi, 1805.

The case we are reporting is of unique interest in that it is the first of its kind found in this country. The condition is certainly very rare, as it is the only one among the 8,000 or more autopsies performed to date in the Manila City Morgue.

The echinococcus cysts were accidentally found by one of us (W. L.) on April 1, 1921, during the course of an autopsy of a case with a clinical diagnosis of cholelithiasis, empyema of the gall bladder, chronic cholecystitis, and cholæmia.

CLINICAL HISTORY OF THE PATIENT

B. V., female, 34 years, admitted to the Philippine General Hospital on March 28, 1921, complaining of pain in the right subcostal region, chills, and fever for three days. She had had two similar attacks during the period of one year. The attacks usually began with a colicky pain, always starting in the right subcostal region and radiating to the right side of the chest and right shoulder, always accompanied by chills, fever, and vomiting, lasting for one week, but without jaundice. The present attack was of much greater intensity, the colicky pains coming on more frequently and the day after the onset jaundice was noticed in the eyes, accompanied by morning rigors and fever.

She was conscious on admission, temperature 38° C., but restless and moaning due to pain. There was generalized jaundice.

The lungs and heart were good.

Abdomen showed slight distension over the upper right quadrant where there were rigidity and tenderness. The spleen was distinctly enlarged. The lower border of the liver could not be made out. At the region of the gall bladder, there was palpated an oblong mass where tenderness was marked and percussion dull (distended and inflamed gall bladder).

The condition became worse daily and on the morning of the day of death she became delirious and restless and the jaundice intense.

NECROPSY FINDINGS AND ANATOMIC DIAGNOSIS

Skin and conjuntivæ icteric. There were adhesions between right lobe of liver and diaphragm and between spleen and peritoneum. Mesenteric lymph nodes enlarged, soft, and congested. Diaphragm on the right side at level of fourth rib and on the left at level of fourth interspace.

Heart small. Conglomerated petechial hæmorrhages at anterior surface of left ventricle. Coronary vessels tortuous and

prominent. Cardiac musculature slightly increased in consistency, brownish yellow, the valves in good condition.

The right lung showed pleural petechial hæmorrhages. Crepitation diminished. No consolidations. The left lung showed at apex small hard nodules bound together by excessive growth of connective tissue with the adjacent pleura. Two fluctuating cystic areas palpated at the lower lobe near the root, the larger one 6 centimeters in diameter, the smaller 4. The cysts were perfectly spherical and entirely filled with a clear, thin, brownish fluid. Floating in this fluid and loosely attached to the inner lining of the cysts were innumerable small, white, flattened granules. These had indented borders and were soft. They measured 2 millimeters in diameter and were uniform in shape and size. The wall of the cysts was smooth. The cysts were entirely closed to the surrounding lung tissue. The lining of the cysts was tough and strong. The lung tissue surrounding the cysts was dense and atelectatic. The rest of the lung tissue was congested.

Spleen very much enlarged; weight, 485 grams. Capsule slightly thickened with broken fibrous tags on surface. It was soft and flabby. Section showed opaque, dull pinkish, diffluent and abundant pulp tissue which scraped off easily.

Liver enlarged and greenish yellow, the capsule thick, showing numerous fibrous tissue tags. In places it was indurated, but in other places friable. Small abscesses on the surface were seen, abundant and prominent along the biliary tracts on the cut surface. They averaged roughly 2 to 3 centimeters in diameter. There were so many in the right lobe that this portion looked as if it consisted of cavities with anastomosing papillary growths. In both the large and the small bile ducts were found elongated, black, easily broken calculi. Gall bladder distended with thick yellowish brown bile. In the cystic duct a large calculus completely obstructed biliary drainage.

Alimentary tract showed evidence of congestion of the mucosa. Pancreas and adrenals also congested.

Kidneys normal in size. The cut surface showed slight connective tissue increase, bulging cortex, injected vessels and glomeruli, and opaque, granular, pinkish parenchyma.

Uterus small. The mucosa showed slight bleeding. Ovaries indurated, the tubes congested.

Anatomic diagnosis.—Septicæmia, cholelithiasis; cholangitic abscesses; empyema, gall bladder; chronic cholecystitis; acute nephritis; acute splenic tumor; chronic apical tuberculosis, left side, with adhesions; echinococcus polymorphus, left lung.

Bacterial findings.—Smears and cultures from spleen, liver, and gall bladder showed colon bacilli.

Histological findings.—Abscesses and marked passive congestion in the liver. Lung showed atelectasis with cysts and tuberculosis and passive congestion. Kidney œdematous, congested, and degenerated. Heart showed œdema, interfibrillar hæmorrhage, fragmentation, and degeneration.

STUDY OF THE HYDATID CYST

Gross examination.—The gross appearance and size of the hydatid has already been referred to in the autopsy report.

MICROSCOPIC STUDY OF THE MATERIAL AND DISCUSSION AS TO MANNER OF FORMATION

WHOLE BROOD CAPSULES

The whitish granules mentioned in the protocol are the brood capsules. These are irregularly distributed on the inner surface of the mother cyst. Most of them are enmeshed in the gelatinous meshwork of the germinal layer; some are already loose in the liquid of the hydatid. They look like bunches of grapes in miniature. They contain multiple scoleces in different stages of development. In some the rostellum with two rows of spines is apparent, in others the suckers (Plate 2, fig. 6). The brood capsules nearest the wall of the mother cyst were not seen to be attached by any definite stalk but by a condensed gelatinous substance. Plate 2, fig. 4, shows a single and a whole brood capsule.

SECTIONS OF THE CYST AND ITS CONTENTS

Cyst wall.—The cyst wall consists of three coats: An outer (Plate 4, fig. 12, *a*), mainly compact connective tissue derived from condensation of the lung tissue immediately surrounding the hydatid; a middle layer (Plate 4, fig. 12, *b*), a homogenous laminated cuticle, the ectocyst proper; and an internal (Plate 4, fig. 12, *c*), germinal or parenchymatous layer, the endocyst. The endocyst is composed of two portions; namely, an inner, consisting of cellular elements, and an outer, the basement membrane.

The cyst covering is uniform in thickness (about 136 μ) except at certain points where it may be very much thinner than the rest of the wall (Plate 5, fig. 18), due to the thinning out of the laminated layer. There may, however, be an over-

growth in some portions of the ectocyst (Plate 5, fig. 17). The cyst wall may have a wavelike appearance (Plate 4, fig. 13).

In trying to peel off the cyst wall from the surrounding tissue, it was noticed that the wall could be separated only with difficulty at certain points; study of the cross sections involving the lung furnishes the explanation. Plate 4, fig. 11, shows the connective tissue layer delving into the laminated layer to become lost in its stratification. Plate 5, fig. 15, shows a portion of the connective tissue prolongation which has already become a part of the ectocyst.

Brood capsules.—At first the cuticular membrane incloses no organized structures, but contains only fluid. It is practically in a bladderlike condition, which is called an "acephalocyst." Later, presumably through proliferation of the germinal layer, the "vesicules proligeres," or brood capsules, are evolved and differentiated (Plate 2, figs. 4, 5, 6, 7; Plate 3, fig. 9).

Study of our sections shows that they are already in an advanced stage, so that their actual origin from the parenchymatous layer cannot be conclusively determined. However, it is noted that the cavity of the brood capsule is lined by a thin cuticle which is similar in structure to the basement membrane in the cyst wall (Plate 8, figs. 27 and 29).

Nevertheless, opinion differs as to how the brood capsules may arise. Stephens(6) makes this conjecture:

> The order of the layers is just the reverse in them to what it is in the parent cyst, that is to say, they have inside a thin non-laminated cuticle and the parenchymatous layer on the external surface. These, theoretically at least, may be regarded as invaginations of the bladder-wall giving rise to a cavity with the cuticle internal and the parenchymatous layer external. If we suppose the orifice to close, we should then get an isolated cavity with cuticle internal and parenchymatous layer external, as in the brood capsule.

Stephens's diagram would thus include the thick laminated layer in the invagination. From the study of our sections we venture to think differently—that probably the proliferation of the parenchymatous layer toward the inside of the cyst cavity drags the basement membrane and causes it to invaginate and form the lining of the hollow of the brood capsule, without involving the laminated stratum. This view is supported to some extent by the fact that the basement membrane with the germinal layer separates very easily from the laminated layer. (Plate 4, figs. 12 and 14; Plate 5, figs. 15 and 17).

Scoleces.—The scoleces, or heads, of the succeeding generation of tæniæ develop from the brood capsules, but observers are not entirely agreed as to the manner of their formation. Leuckart's views represent the old ideas of Wagener, Naunyn, Rasmussen, and Vuillemin, while Moniez takes the opposite stand.

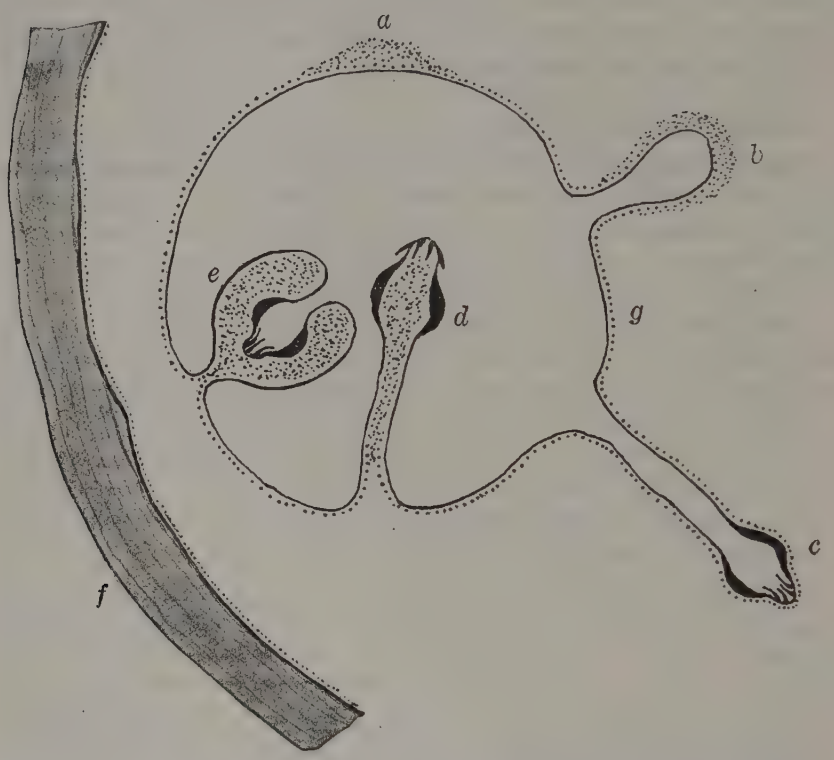


FIG. 1. Diagrammatic representation of mode of formation of the scolex, according to Leuckart; *a*, anlage of the head, thickening of the parenchymatous layer; *b*, the proliferation of cells growing out into the cavity of the hydatid cyst, at the same time carrying into it a diverticulum of the brood capsule; *c*, formation of the scolex with its hooklets; *d*, invagination of the diverticulum and more proliferation of the germinal cells; *e*, the rostellum and suckers invaginate into the posterior portion of the scolex; *f*, cyst wall, composed of the ectocyst, the laminated layer externally and the endocyst internally, the latter consisting of a basement membrane and a cellular layer represented by the dotted line; *g*, wall of the brood capsule.

According to Leuckart(10) the "Anlage" of the head is a disklike thickening of the parenchymatous layer which forms the covering of the brood capsule (fig. 1, *a*). This proliferation of cells grows out into the cavity of the hydatid cyst, at the same time carrying into it a diverticulum of the brood capsule (fig. 1, *b*). At the bottom of this hollow bud or "Hohlknospe"

is formed the scolex with its hooklets and suckers (fig. 1, *c*). The specimen figured in Plate 7, fig. 24, may be said to represent this stage. The hollow scolex which arose at first as an evagination of the wall of the brood capsule now invaginates.

Our sections show that, probably soon after this invagination, an intense proliferation of the germinal cells takes place between the walls of the diverticulum; so that, instead of a hollow scolex, we have now a solid process projecting into the cavity of the brood capsule (fig. 1, *d*; Plate 8, figs. 28 and 29; Plate 9, figs. 30 and 31). The constriction at the base is seen early in this stage. Lastly, the rostellum and suckers become invaginated into the posterior portion of the scolex (fig. 1, *e*), and this becomes more constricted at the base (Plate 7, fig. 24). The latter is the last stage in the formation of the mature scolex.

One can thus follow the cuticle and germinal layer of the hollow process with the aid of the accompanying diagram (fig. 1). Through the various evaginations and invaginations, the stage is finally reached where the round bud (fig. 1, *e;* Plate 6, fig. 22; Plate 8, fig. 27) projects into the cavity of the brood capsule with the rostellum and suckers withdrawn into the posterior portion of the scolex. The thin stalk may break off and there are loose heads (Plate 3, fig. 9; Plate 7, fig. 23), sometimes called "sands," inside the brood capsule.

Leuckart observed a high degree of contractility of the "Hohlknospe" which is responsible for the turning out and in of such diverticula. This is due to the presence of a good system of musculature which differentiates and develops early in the germinal walls of the hollow scolex, as has been worked out by Goldschmidt.(9) This feature is very evident in our sections as shown in the different stages of either contraction or extension of the bodies of the scoleces inside the brood capsule (Plate 8, figs. 28 and 29; Plate 9, figs. 30 and 31).

Besides the exogenous development of the "Hohlknospe," Leuckart states that the hollow process may grow into the inside of the brood capsule very early and here the development is completed. Regarding this point Goldschmidt(9) makes this statement:

> Neben dieser von Leuckart als typisch angesehenen exogenen Entwickelung soll es auch vorkommen, dass die Hohlknospen auf einem frühern Stadium in das Innere gelangen und hier ihre Entwickelung vollenden, wobei sie aber zu dem zuletzt erfolgenden Zurückziehen des Vorderendes Hohlknospen bleiben.

Moniez,(12) on the other hand, contradicts the views of Leuckart. He states that the first "Anlage" of the head (fig. 2, *a*) grows directly on the inside toward the cavity of the brood capsule, and not toward the hollow of the hydatid cyst. Furthermore, it always remains solid and there is never any trace of a diverticulum in the whole developmental history, from the "Anlage" to the mature scolex (fig. 2, *a*, *b*, *c*, *d*).

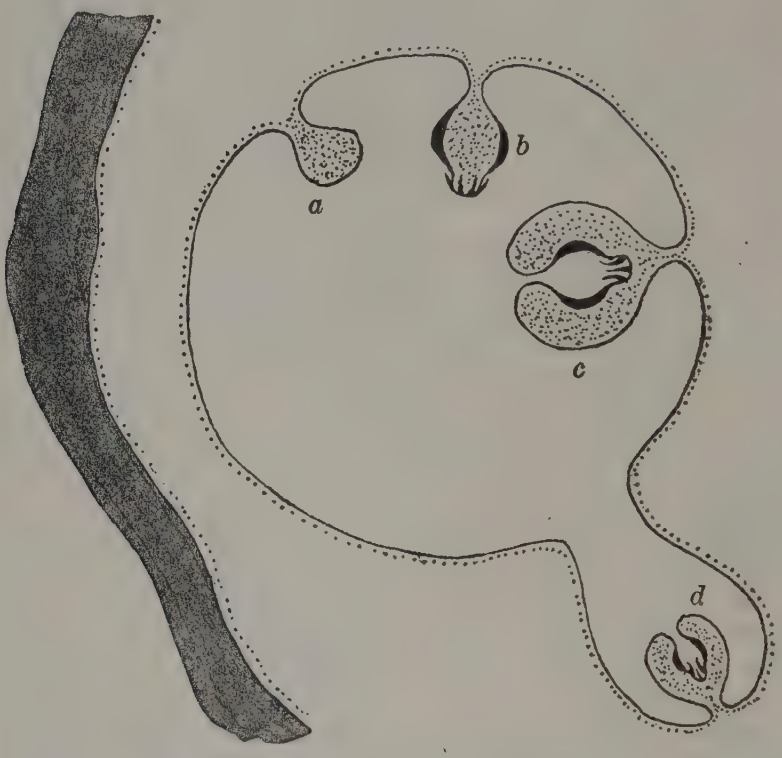


FIG. 2. Diagrammatic representation of mode of formation of the scolex, according to Moniez; *a*, first anlage of the head growing directly into the inside of the brood capsule; *b* and *c*, transformations of the developing scolex; *d*, scolex developing on the wall of a diverticulum of the brood capsule.

However, it is admitted by Moniez that he has observed the so-called exogenous "Hohlknospen" of Leuckart, but he has a different interpretation for them. He believes that the hollow process is simply a diverticulum of the brood capsule wall which may even separate and form an independent brood capsule. At the bottom of such an evaginated brood capsule wall, according to him, the head arises, which develops after the endogenous manner of formation already referred to (fig. 2, *d*).

In one of our cross sections of the brood capsules (Plate 9, fig. 30) there can be seen growths on the wall which may simulate the Moniez manner of formation of the head; but on closer analysis it will be observed that they are peduncular parts of the scolex body cut tangentially, so that they seemingly have lost their connections with the rostellar portions.

The researches of Goldschmidt(9) afford data by which the contradictory views of Leuckart and Moniez may be more or less harmonized.

Goldschmidt's account is as follows: The development on the wall of the brood capsule is introduced by a proliferation of the parenchymatous coat at certain places of the brood capsule (fig. 3, *a*). A small knoblike structure is formed, the base of which is covered by the already thickened cuticle. While this knob grows further, it raises itself gradually on the surface of the brood capsule. Coincident with this there, goes on another

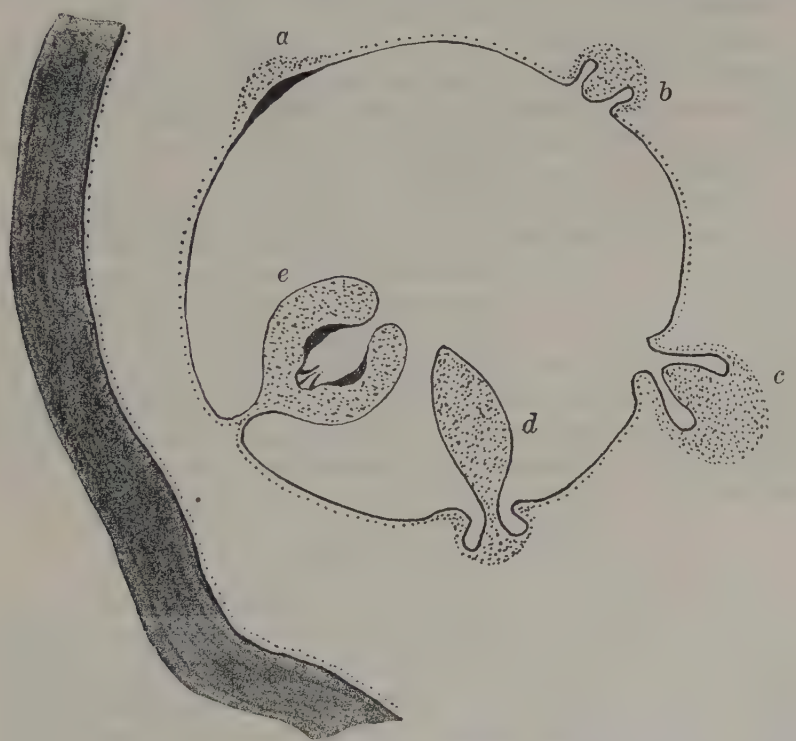


FIG. 3. Diagrammatic representation of mode of formation of the scolex, according to Goldschmidt; *a*, proliferation of the parenchymatous coat and thickening of the cuticle; *b*, formation of a circular furrow, or sulcus; *c*, the furrow deepens, giving rise to a tonguelike structure, the anlage of the rostellar part of the head; *d*, the tonguelike structure further projects into the cavity of the brood capsule; *e*, mature scolex.

process, initiated by the cuticle, which is the formation of a circular furrow or sulcus (fig. 3, *b*). This furrow deepens, thereby bringing into prominence a tonguelike structure which is the "Anlage" of the rostellar part of the head. This stage would correspond to Leuckart's diverticulum, or "Hohlknospe." It also would represent a stage which Moniez might have interpreted as formation of the head directly from the inside of the brood capsule, especially when the tonguelike structure further projects into the cavity of the brood capsule. Goldschmidt states that if one is not careful in the preparation and sectioning of the broods, he is liable to miss the formation of the furrow.

Rostellum and suckers.—The rostellar portion is formed early. Goldschmidt, who studied the evolutionary development of this stage of the worm, states that there take place as the last steps the turning in of the rostellar "Anlage" and the closing in afterward of the cuticle over it (Plate 9, figs. 28 and 29; Goldschmidt's figs. 10 and 11). Our specimens evidently would represent fig. 11 of Goldschmidt.

Lower down from the rostellar portion is found the beginning of the formation of the suckers. This is represented by the concave disk formation with the concavity directed outward, and by a strong proliferation of the parenchyma cells around the concavity (Plate 9, fig. 31).

Following this stage is the interesting invagination of the rostellum with the hooks (Plate 5, fig. 18). This is carried to completion as shown in Plate 6, fig. 22, which represents a longitudinal section. It will be noted that by this time the suckers are nearly organized. Plate 8, fig. 26, shows a section through the invaginated scolex at the stage in which the suckers are still communicating with each other. Plate 6, figs. 19, 20, and 21, shows horizontal sections passing about the region of the insertion of the hooks. The much-thickened cuticula in this portion of the scolex is well shown.

LIFE HISTORY OF THE PARASITE

The hydatid or echinococcus cyst, technically known as *Echinococcus polymorphus* Diesing, is only one stage, the larval stage, in the life cycle of a cestode worm. Both the larval and the adult forms have been given different names by various observers at different times, which resulted in no little confusion in the past. The peculiarly long list of synonyms as given by Stiles(13) will illustrate this point.

Other names for the adult worm (*Taenia echinococcus* Siebold, 1853) are:

1. *"Taenia cateniformis"* misdet. pro parte Rudolphi, 1808.
2. *"Taenia cucumerina* Bloch" misdet. pro parte, Diesing, 1850.
3. *"Taenia serrata"* misdet. Roll, 1852.
4. *Taenia echinococcus* Siebold (1853).
5. *Taenia nana* Beneden, 1858 (nec Siebold, 1852).
6. *Taenia* (*Echinococcifer*) *echinococcus* of Leuckart, 1863.
7. *Taenia* (*Arhynchotaenia*) *echinococcus* of Diesing, 1864.
8. *Taenia* (*Echinococcus*) *echinococcus* of Railliet, 1886.
9. *Taenia "echinokokkus"* of Schneidemuhl, 1896.

Other names for the larval stage (*Echinococcus polymorphus* Diesing, 1850) are:

1. *Taenia visceralis socialis granulosa* Goeze, 1782.
2. *Hydatigena granulosa* Batsch, 1786.
3. *Vesicaria granulosa* (Batsch) Schrank (1788).
4. *Taenia granulosa* (Batsch) Gmelin, 1790.
5. *Polycephalus hominis* Zeder, 1800.
6. *Echinococcus* Rudolphi, 1802.
7. *Polycephalus humanus* Zeder, 1803.
8. *Polycephalus granulosus* (Batsch) Zeder, 1803.
9. *Polycephalus echinococcus* Zeder, 1803.
10. *Acephalocystis* Laennec, 1804.
11. *Echinococcus granulosus* (Batsch) Rudolphi, 1805.
12. *Hydatis erratica* Blumenbach, 1805.
13. *Acephalocystis humana* Ludersen (1808).
14. *Acephalocystis suilla* Ludersen (1808).
15. *Echinococcus hominis* (Zeder) Rudolphi, 1810.
16. *Echinococcus simiae* Rudolphi, 1810.
17. *Echinococcus veterinorum* Rudolphi, 1810.
18. *Polycephalus granosus* Laennec, 1812.
19. *Acephalocystis ovoidea* Laennec, 1812.
20. *Acephalocystis cystifera* Laennec, 1812.
21. *Acephalocystis granosa* Laennec, 1812.
22. *Acephalocystis surculigera* Laennec, 1812.
23. *Acephalocystis intersecta* Laennec, 1812.
24. *Acephalocystis ansa* Laennec, 1812.
25. *Echinococcus infusorium* F. S. Leuckart (1827).
26. *Acephalocystis eremita sterilis* Cruvielhiel (?).
27. *Acephalocystis prolifera socialis* Cruvielhiel (?).
28. *Acephalocystis endogena* Kuhn (1830).
29. *Acephalocystis exogena* Kuhn (1830).
30. *Acephalocystis granulosa* Chiaje, 1833.
31. *Acephalocystis communis* Chiaje, 1833.
32. *Acephalocystis prolifera* Chiaje, 1833.
33. *Acephalocystis simplex* Goodsir, 1844.
34. (*??*) *Diskostoma acephalocystis* Goodsir, 1844.
35. (*??*) *Astoma acephalocystis* Goodsir, 1844.
36. *Echinococcus arietis* E. Blanchard, 1848.

37. *Echinococcus giraffae* Gervais (?).
38. *Echinococcus polymorphus* Diesing, 1850.
39. *Echinococcus pardi* Huxley (1852).
40. *Echinococcus scoliciparíens* Kuchenmeister, 1855.
41. (?) *Acephalocystis macaci* Cobbold, 1861.
42. (?) *Acephalocystis ovis tragelaphi* Cobbold, 1861.
43. *Cysticercus echinococcus* (Zeder) Koeberlé, 1861.
44. *Echinococcus cerebri* Spiering, 1862.
45. *Echinococcus hepatis* seu process, vermiformis Scholler, 1862.
46. *Echinococcus hydatidosus* R. Leuckart, 1863.
47. *Echinococcus endogena* (Kuhn, 1830) Leuckart, 1863.
48. *Echinococcus multilocularis* Leuckart, 1863.
49. *Echinococcus lienis* Kehlberg, 1873.
50. *Echinococcus pulmonum* Huppert, 1875.
51. *Echinococcus multilocularis hepatis* Haffter, 1875.
52. *Echinococcus intercranialis* Fricke, 1880.
53. *Echinococcus simplex* Leuckart, 1880.
54. *Echinococcus racemosus* Leuckart, 1880.
55. *Echinococcus multiplex* Stiller, 1882.
56. *Echinococcus alveolaris* R. Blanchard, 1886.
57. *Echinococcus retroperitonialis* Bitter, 1886.
58. *Echinococcus mesenterii* Surman, 1891.
59. *Echinococcus cerebralis* Perroncito (18....).
60. *Echinococcus cysticus* Huber, 1891.
61. *Echinococcus unilocularis* Huber, 1896.
62. *Echinococcus multilocularis exulcerans* Huber, 1896.
63. *Echinococcus osteoklastes* Huber (?) 1896.
64. *Echinococcus subphrenicus* Huber, 1896.
65. *"Echinokokkus"* (!) of Schneidemuhl, 1896.

The adult tænia (Plate 1, fig. 2) measures 2 to 6 millimeters in length and consists of three to four segments. The head is described as having a double row of hooklets in the rostellum. In our specimen (Plate 1, fig. 3), which was obtained from a dog, there is an inner row of 18 large hooklets and an outer row of 18 small hooklets. It commonly lives in the intestine of dogs, jackals, wolves, and cats. It has never been found in man.

The larval form has been found in various organs, frequently in the liver and lungs of sheep, pigs, and man, and many other species of mammals.

The cycle may be represented as starting from an egg which is liberated from a ripe segment. Upon arriving in the stomach of an intermediate host (for example, sheep) the eggshell is destroyed and the 6-hooked embryo now bores its way through the intestinal wall and wanders to the various organs of the body; that is, liver, lungs, or other viscera. Here it develops into a simple bladderlike structure, containing fluid but no

scoleces. This stage is called the "acephalocyst." This may develop further into the mature echinococcus containing brood capsules with scoleces. In case this stage develops in man, the life history of the parasite may end here. If it occurs in swine, cattle, or sheep, the story may be different. Where the offal of these animals is carelessly given to dogs, the life cycle of the parasite may thus be completed.

To recapitulate, *Echinococcus* is a parasitic cestode which has the dog for the primary host, as that animal harbors the adult stage of the worm; man, swine, cattle, and sheep are the secondary or intermediate hosts.

INCIDENCE

Echinococcus disease of man must be rare in the Philippines, judging from the autopsy records of the Manila City Morgue. It is however cosmopolitan in distribution, and it can really be axiomatically stated that "the echinococcus disease is as widely distributed as is the dog." It is however more prevalent in certain places than in others. It is common in Iceland, Australia, and New Zealand, and in certain parts of South America and Europe. It has been reported also from the United States and Canada. Lyon,(11) up to 1902, collected in all 240 cases from North America. Of these, the percentage distribution by organs ran as follows: 73.7 per cent were encountered in the liver; 10.8, in the omentum, peritoneal cavity, peritoneum, mesentery; and 4.5, in the lung.

The right lung seems to be more often affected than the left lung. The cysts may be either single or multiple. They may occur in only one lung, or simultaneously in both lungs. The cases in which such distribution is reported are shown in Table 1.

Statistics have been published showing influence of age, sex, and race on incidence of echinococcus infestation; but, as far as the biological attributes of the parasite are concerned, there seems to be no special predilection toward any such item, as the main factor is undoubtedly close association with infested dogs.

PATHOGENESIS

Cysts grow slowly, so that there is time for the tissues to make accommodations. The time of appearance of symptoms depends on the degree of tissue accommodation. The cyst may grow to the size of a child's head.

The hydatid may become absorbed, caseated or calcified, or secondarily infected.

TABLE 1.—*Cases of Echinococcus infestation showing location of cysts in the lung.*

[Number of + signs represents number of cysts.]

Observer.	Country.	Date reported.
Stone	United States	1903
Araz Alfaro	South America	1919
Buzzi	do	1919
Balboni	United States	
Do	do	
Alexander	Germany	1921
Ferro	Italy	1921
Cranwell and Vegas		
De Leon and Leiva	Philippines	1924

Observer.	Involving—			Remarks.
	Right lung.	Left lung.	Both lungs.	
Stone			+	Concurrent infestation of the liver.
Araz Alfaro	Multiple	+		Case mentioned by Buzzi.
Buzzi	+ +			
Balboni	+			
Do			Multiple	Probable cyst of kidney.
Alexander	+			
Ferro			Multiple	
Cranwell and Vegas	+ +			Mentioned by Balboni.
De Leon and Leiva		+ +		

The cystic fluid is toxic. Rupture into the lung may prove fatal. The fluid will cause urticaria, rigors, local pain, and tenderness.

DIAGNOSIS

Complement fixation test and x-ray are two chief means of diagnosis. In case of rupture into a bronchus, finding of the hooklets and, possibly, pieces of laminated layer will establish the diagnosis.

PROPHYLAXIS AND TREATMENT

Guard dogs from being infected with the cystic stage around slaughter houses by eating infested meat. Avoid close association with dogs.

Surgical intervention is advised whenever practicable. Exposure to x-ray may be tried.

REFERENCES

1. Alexander, H. Lungenechinokokkus und Pneumothorax-Behandlung. Zentralbl. f. Inn. Med. nr. 47, 41 (Nov. 20, 1920) 801.
2. Balboni, G. M. Hydatid cyst of the lung. Boston Med. and Surg. Journ. 187 (1922) 879.
3. Buzzi, A. Sobre un caso de doble quiste hidatico de pulmon derecho. Lo Prensa Medica, Argentina, Buenos Aires, No. 4 (July 10, 1919) 42.
4. Castellani, A., and A. J. Chalmers. Manual of Tropical Medicine. Wm. Wood and Co., New York (1920).
5. Crowell, B. C., and R. W. Hammack. Intestinal parasites encountered in five hundred autopsies, with reports of cases. Philip. Journ. Sci. § B 8 (1913) 157.
6. Fantham, H. B., J. W. W. Stephens, and F. V. Theobald. The Animal Parasites of Man. Wm. Wood and Co., New York (1916).
7. Ferro, P. Hydatid cysts of the lung. Riforma Med. No. 38 (September 21, 1921).
8. Garrison, P. E. A preliminary report upon the specific identity of the cestode parasites of man in the Philippine Islands with a description of a new species of Taenia. Philip. Journ. Sci. § B 2 (1907) 537.
9. Goldschmidt, R. Zur Entwickelungsgeschichte der Echinococcus Köpfchen. Zoologische Jahrbücher Anat. 13 (1900) 467.
10. Leuckart, R. Die Parasiten des Menschen und die von ihnen herrührenden Krankheiten. Leipzig u. Heidelberg 2. Aufl. (1879–1886).
11. Lyon, I. P. A review of Echinococcus disease in North America. Am. Journ. Med. Sci. 123 (1902) 124.
12. Moniez, R. Essai monographique sur les Cysticerques. Paris (1880).
13. Stiles, C. W. I. The flukes and tapeworms of cattle, sheep, and swine, with special reference to the inspection of meats. U. S. Dept. Agr. Bur. Anim. Industry Bull. No. 19 (1898) 113.
14. Stone, A. K. Echinococcus cysts of the liver and lungs. Boston Med. and Surg. Journ. 149 (1903) 263.
15. Strong, R. P. Circulars on Tropical Diseases 1 (1901) 22.
16. Wharton, L. D. The intestinal worms of dogs in the Philippine Islands. Journ. Parasitol., Urbana, Ill. 4 (1917) 80.

ILLUSTRATIONS

[Figures in plates 4 to 9 are microphotographs, × 2,750. The specimens are sagittal sections except when otherwise specified.]

PLATE 1

FIG. 1. Two cysts: *a*, one of the cysts found in the left lung which was opened to show the contents. It shows the granules (brood capsules) clinging on the wall of the hydatid; *b*, another echinococcus cyst, the larger of the two, cut open, with the contents removed.

2. The whole adult worm, *Taenia echinococcus*, whose body consists of three proglottids only. × 325.

3. A more magnified photograph of the scolex showing the arrangement of an inner row of 18 large hooklets and an external row of 18 small hooklets on the rostellum.

PLATE 2

FIG. 4. Single brood capsule with the scoleces inside. × 325.

FIGS. 5, 6, and 7. The brood capsule shown in fig. 4, at higher magnification. × 2750.

PLATE 3

FIG. 8. Section of part of the cyst and the adjoining lung tissue, showing the cut sections of the brood capsules.

9. The section shown in fig. 8, under lower magnification.

10. Connective tissue of the lung delving into the laminated layer of the cyst wall.

PLATE 4

FIG. 11. The wavy outline of a portion of the cyst wall and the extreme thinning out of the wall at *x*.

12. *a*, condensation of connective tissue of the lung immediately surrounding the hydatid, forming a definite layer; *b*, ectocyst, the laminated layer; *c*, endocyst, the internal, germinal or parenchymatous layer, consisting of an outer basement membrane and an inner portion composed of cellular elements.

13. The connective tissue of the lung now forms part of the laminated layer. See the original delving in of such in fig. 10.

14. An island of laminated cuticle surrounded by the connective-tissue layer.

PLATE 5

FIG. 15. A portion of the cyst wall showing irregularity of thickness of the laminated layer.

16. Thinning of the laminated cuticle at this region.

FIG. 17. Separation of the parenchymatous layer from the laminated cuticle.
18. Invagination of the rostellum with the hooks into the main portion of the bud.

PLATE 6

FIG. 19. Horizontal section of an invaginated scolex. Section plane passing about the region of the insertion of the hooks.
20. The same as fig. 19.
21. The same as fig. 19.
22. Complete invagination of the rostellum into the body of the scolex, the beginning of which is evident in fig. 18.

PLATE 7

FIG. 23. The thin stalk at *x* may break off and scoleces become loose inside the brood capsule.
24. Constriction of the base of the scolex forming the typical stalk connecting a scolex with the wall of the brood capsule; *x*, formation of a scolex in a diverticulum directed into the cavity of the hydatid.
25. One of the scoleces, showing the formation of the suckers. The suckers are in a stage in which they are still communicating with each other.

PLATE 8

FIG. 26. One of the scoleces, showing the formation of the suckers. The suckers are in a stage in which they are still communicating with each other.
27. The round bud projects into the cavity of the brood capsule. The rostellum and suckers are withdrawn into the posterior portion of the scolex.
FIGS. 28 and 29. Immature buds. These are the ones that will later invaginate and form the mature scoleces.

PLATE 9

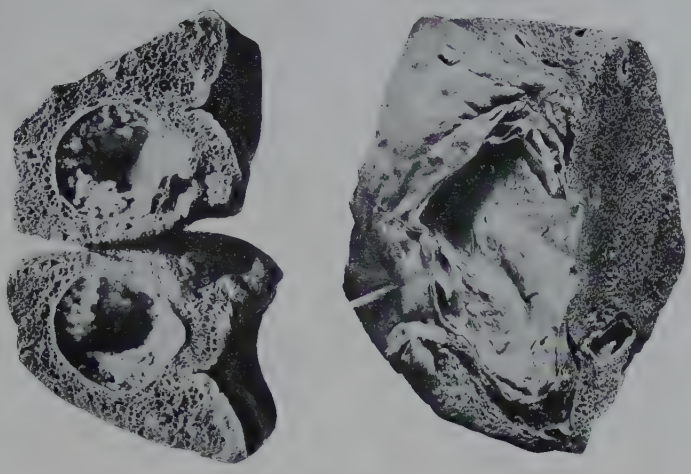
FIGS. 30 and 31. Immature buds that will later invaginate and form the mature scoleces.

TEXT FIGURES

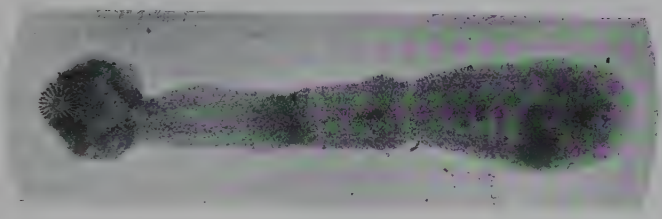
FIG. 1. Diagrammatic representation of mode of formation of the scolex, according to Leuckart; *a*, anlage of the head, thickening of the parenchymatous layer; *b*, the proliferation of cells growing out into the cavity of the hydatid cyst, at the same time carrying into it a diverticulum of the brood capsule; *c*, formation of the scolex with its hooklets; *d*, invagination of the diverticulum and more proliferation of the germinal cells; *e*, the rostellum and suckers invaginate into the posterior portion of the scolex; *f*, cyst wall, composed of the ectocyst, the laminated layer externally and the endocyst internally, the latter consisting of a basement membrane and a cellular layer represented by the dotted line; *g*, wall of the brood capsule.

FIG. 2. Diagrammatic representation of mode of formation of the scolex, according to Moniez; *a*, first anlage of the head growing directly into the inside of the brood capsule; *b* and *c*, transformations of the developing scolex; *d*, scolex developing on the wall of a diverticulum of the brood capsule.

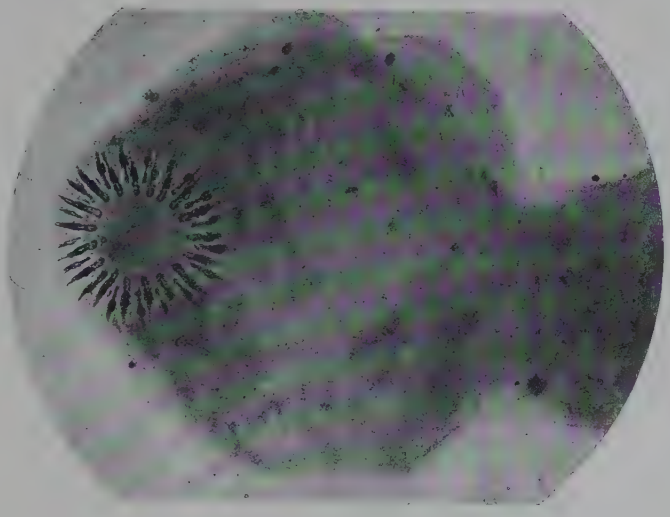
3. Diagrammatic representation of mode of formation of the scolex, according to Goldschmidt; *a*, proliferation of the parenchymatous coat and thickening of the cuticle; *b*, formation of a circular furrow, or sulcus; *c*, the furrow deepens, giving rise to a tonguelike structure, the anlage of the rostellar part of the head; *d*, the tonguelike structure further projects into the cavity of the brood capsule; *e*, mature scolex.



a 1 b



2



3

PLATE 1.

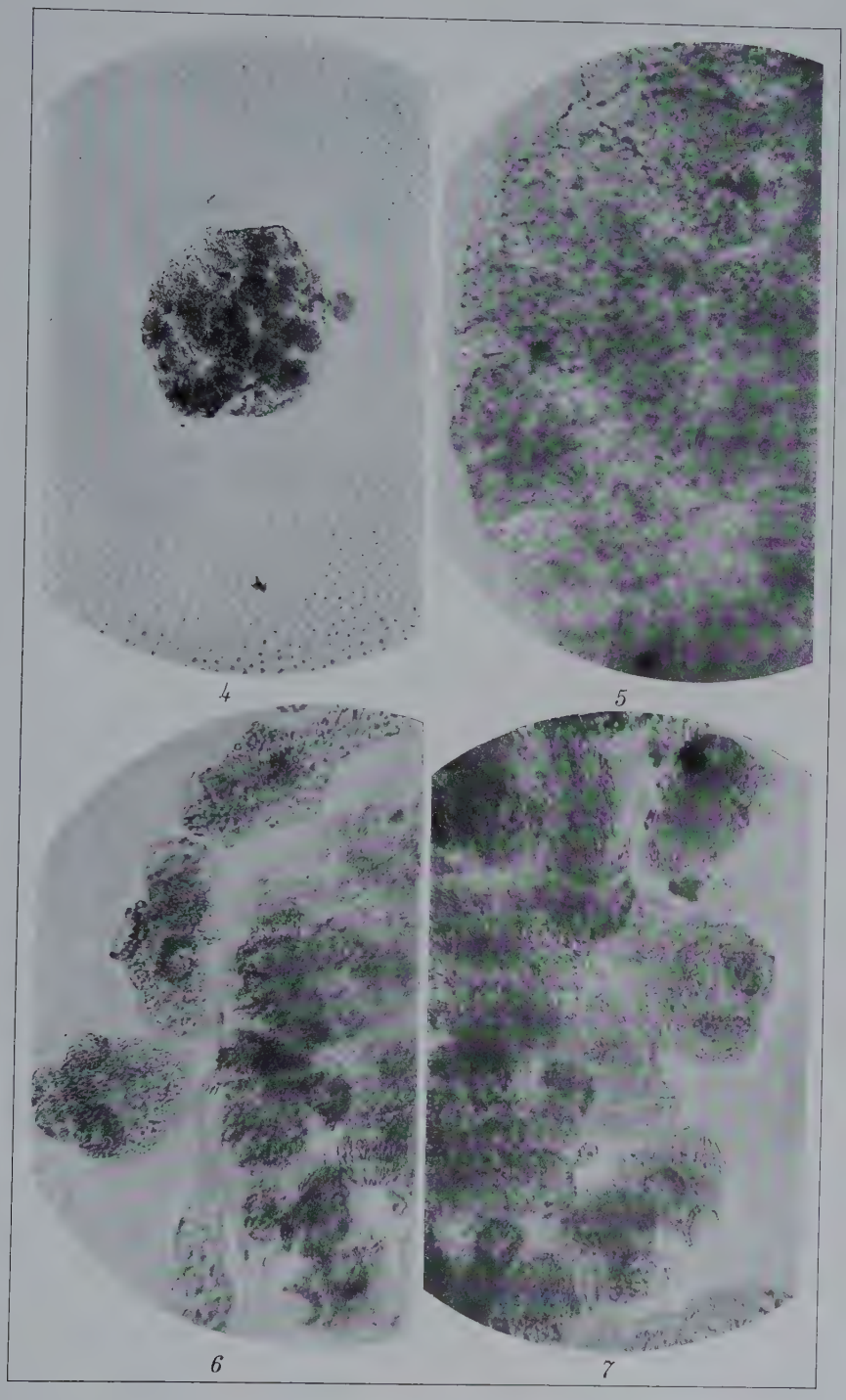
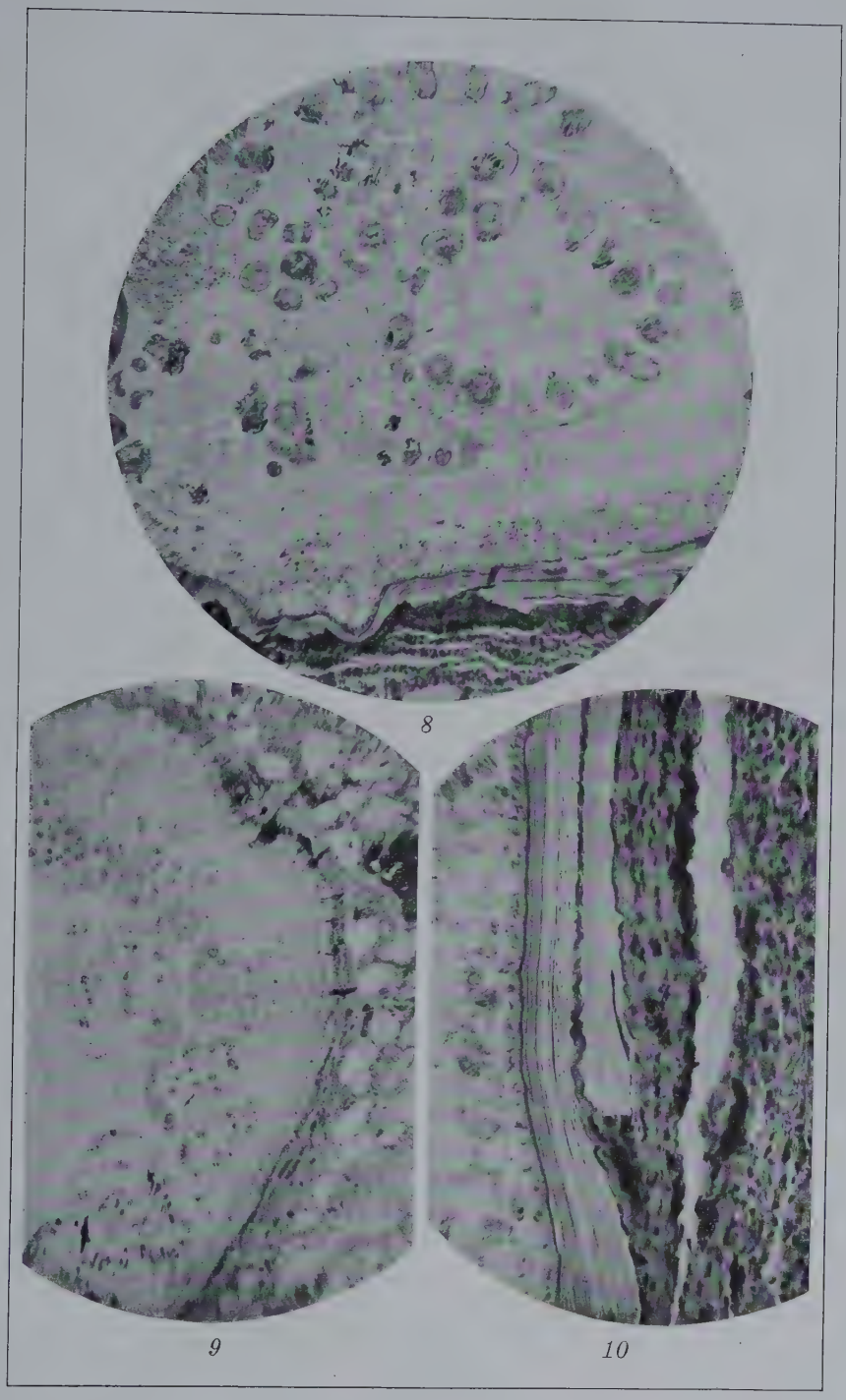


PLATE 2.



8

9

10

PLATE 3.

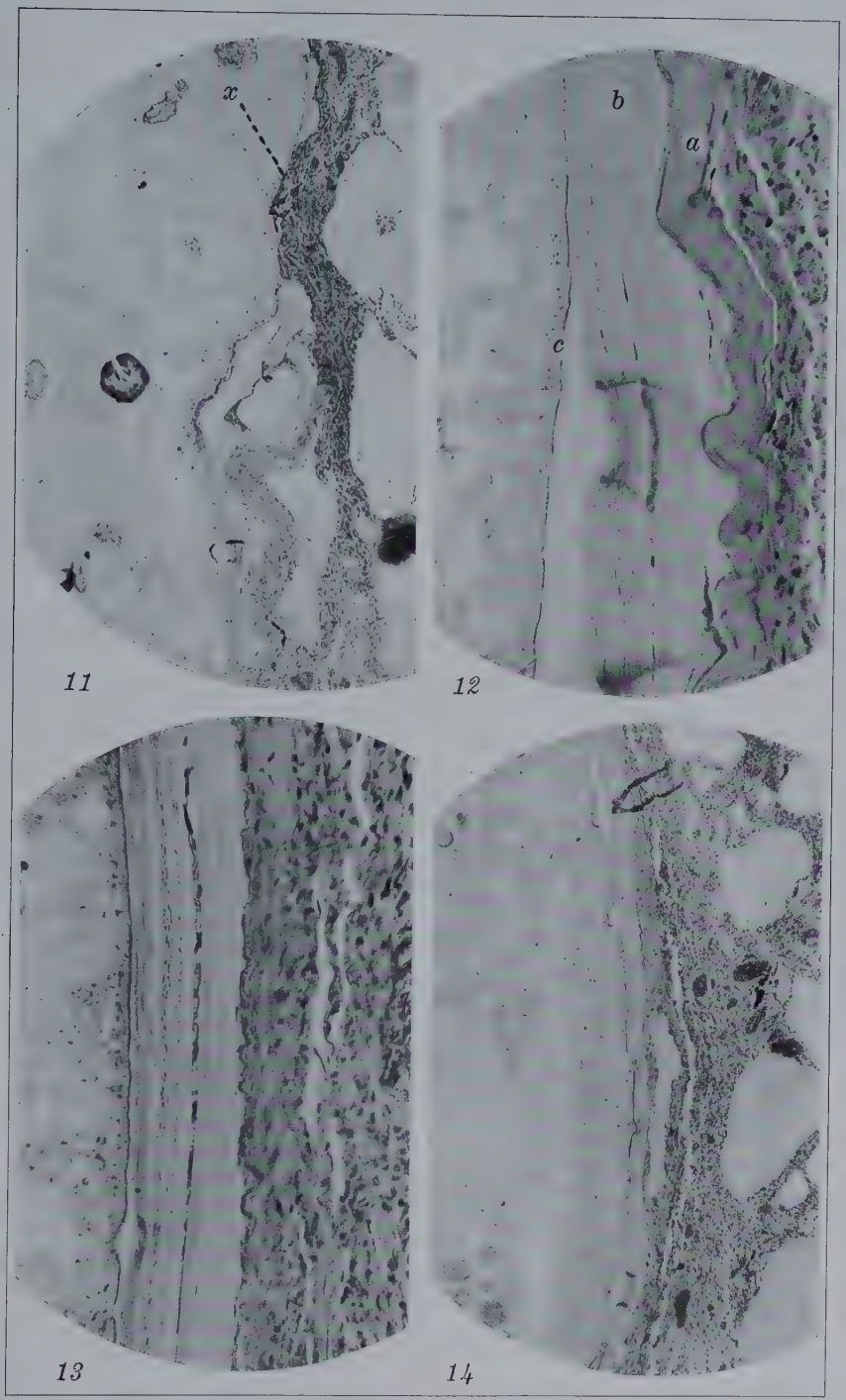


PLATE 4.

PLATE 5.

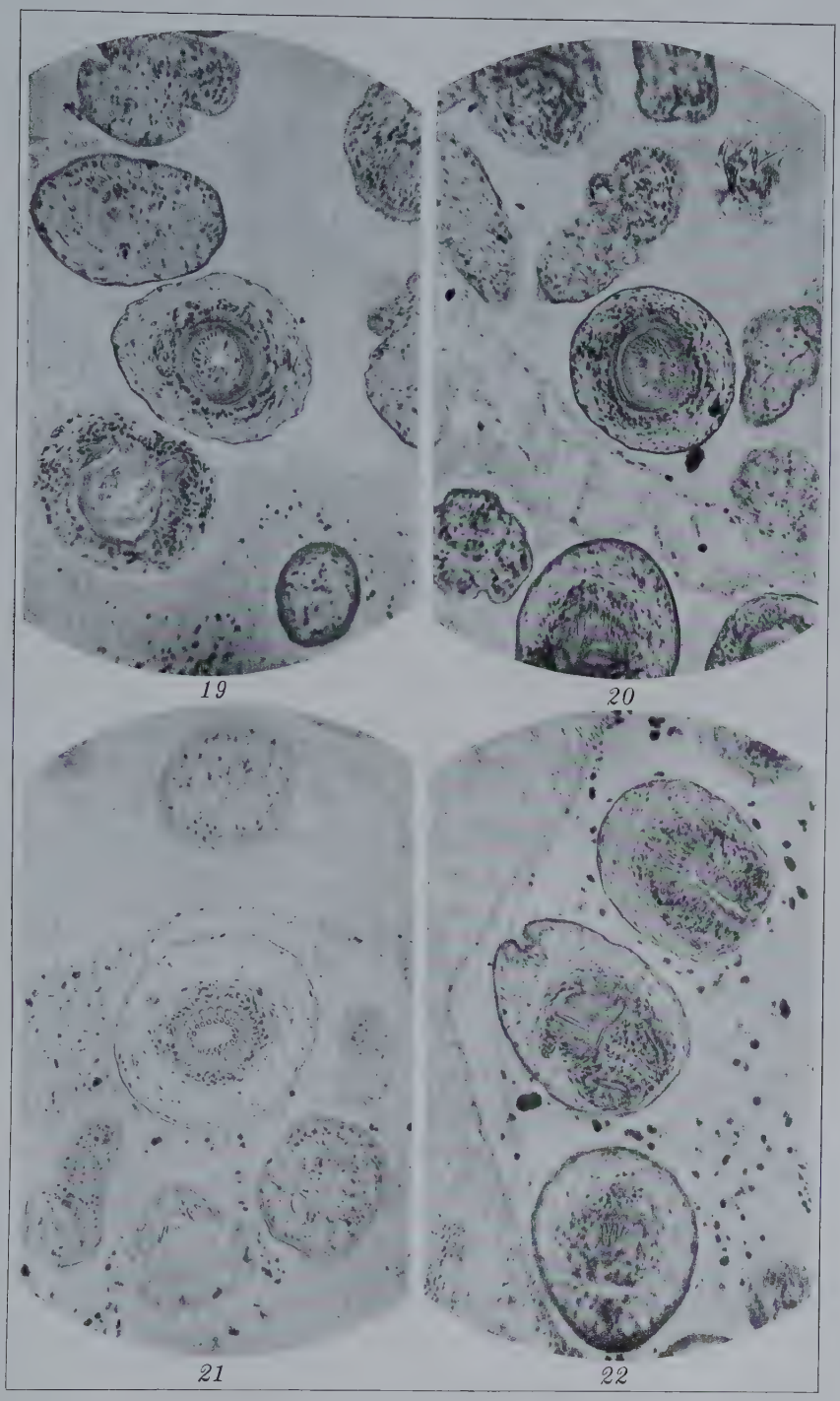


PLATE 6.

PLATE 7.

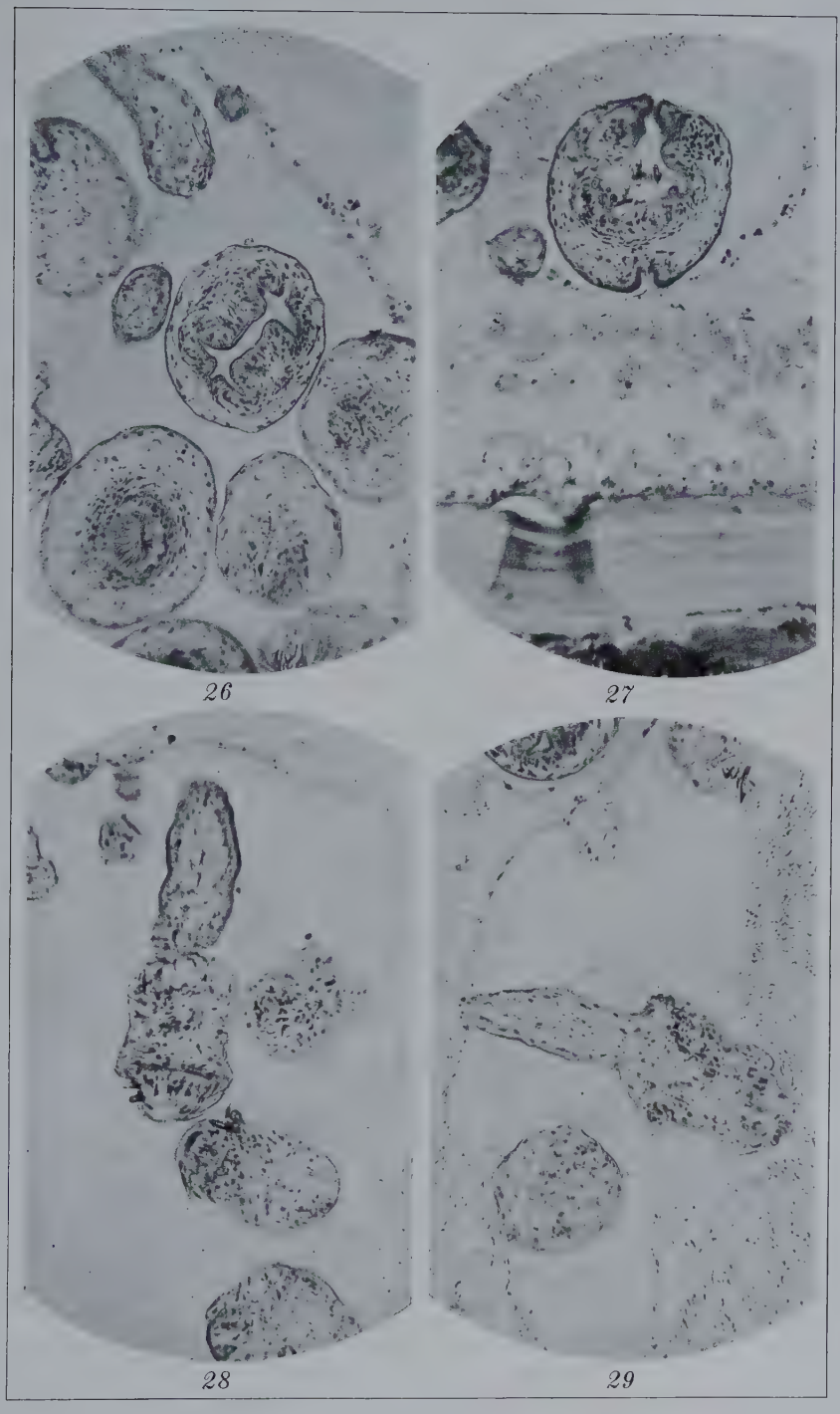
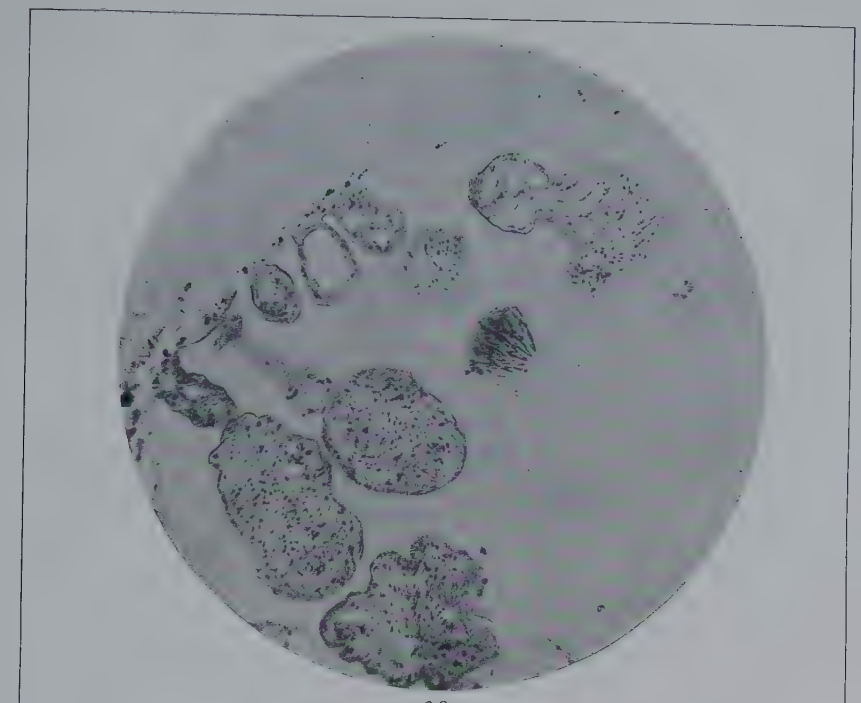


PLATE 8.



30

31

PLATE 9.

CURCULIONIDES NOUVEAUX DES PHILIPPINES ET L'ORIENT

Par A. HUSTACHE[1]

Of Lagny (Seine et Marne), France

Orchestes anoploideus sp. nov.

Ovale, très convexe, noir brun, les antennes et les tarses testacés, revêtu d'une fine pubescence couchée grise, peu serreé, un peu plus longue et plus blanche en dessous, l'écusson petit, en demi-ovale, cendré.

Rostre épais, subcylindrique, un peu amincé en avant, plus court que le prothorax, presque droit, rugueux, finement sétosulé, ferrugineux et lisse seulement au sommet. Antennes fines, médianes, le scape plus clair, le funicule de 6 articles, le 1er obconique et peu allongé, le 2e oblong, les suivants courts, serrés, ne croissant que très peu en épaisseur, la massue oblongue, articulée, foncée, pubescente. Yeux grands, peu convexes, séparés en dessus par une étroite ligne de pubescence. Tête conique, courte, densément ponctuée et pubescent. Prothorax petit, plus du double aussi large que long, la base fortement arquée et presque du double aussi large que le bord antérieur, les côtés arqués rétréces de la base au sommet, convexe, densément et assez grossiérement ponctué rugueux, pubescent. Elytres ovales, séparément arrondis au sommet, le calus huméral un peu elevé, les épaules obtusément arrondies, convexes, brièvement déprimés le long de la base, les stries larges, ponctuées et pubescents, les interstries plus larges que les stries, convexes, rugueux et pubescents. Pattes courtes, ponctuées et pubescents; fémurs inermes, les postérieurs fortement renflés; tibias courts, les postérieurs carénés sur leur tranche externe, leurs corbeilles tarsales très obliques, ascendants, leurs soies jaunes; tarses courts, les ongles appendiculés. Dessous a ponctuation serrée, plus fine sur l'abdomen, métasternum marqué sur son bord pos-

[1] Les especes décrites, sauf indication contraire, font parteé de la collection de M. C. F. Baker et de la mienne.

térieur de trois fossettes, la médiane plus petite et ronde. Longueur, 2.2 millimètres.

Singapore (*Baker*).

Cette espèce a tout le fasciés d'un *Anoplus*.

Nanophyes griseus sp. nov.

Noir, le scape antennaire et les trochanters testacés revêtu d'une dense pubescence appliquée, courte et grise en dessus, plus longue et plus blanche en dessous, seulement un peu plus serrée, sur les côtes de la poitrine mais ne formant pas de tache distincte; les élytres ornés d'une grande tache basale triangulaire de pubescence brun foncé.

Rostre aussi long que la tête et le prothorax, presque droit, fortement pluristrié caréné et ponctué à la base, lisse et pointillé seulement vers le sommet. Antennes médianes, robustes, le funicule a pubescence cendrée, dense et un peu hérissée, de cinq articles, les deux premiers un peu allongés, égaux, le 1er testacé, les 3e, 4e, 5e graduellement un peu plus épais et courts, la massue plus longue que le reste du funicule, son 1er article court, conique, contigu au 5e article, le 2e ovale oblong, mieux détaché, le 3e oblong fusiforme et beaucoup plus long que les deux précédents ensemble. Tête a pubescence cendrée, serrée autour des yeux. Prothorax trapézoidal, du double aussi large que long, la base fortement et régulièrement arquée, plus du triple aussi large que le bord antérieur; régulièrement convexe en dessus, très légèrement impressionné latéralement dans les angles antérieurs, la ponctuation et la pubescence tres serrées, fines. Elytres ovales triangulaires, plus longs que larges, le calus huméral effacé; convexes, visiblement impressionnés transversalement derriére le bord antérieur, les stries tres fines, peu visibles, voilées par la pubescence, les interstries plans. Pattes robustes et densément pubescentes de cendré; fémurs fortement renflés et munis de quatre épines, l'interne la plus longue; tibias arqués; tarses bruns, angles sondés a la base. Longueur, 2.8 millimètres.

Singapore (*Baker*).

Nanophyes fulvipes sp. nov.

Brun noir, les pattes (genoux, sommet des articles des tarses, ongles foncés exceptés), le scape antennaire d'un jaune rouge, revêtu d'une pubescence cendrée appliquée, en dessus tres courte, formant une fascie oblique et médiane sur les élytres, en dessous

plus longue, blanche et tres serrée, formant tache sur les côtés de la poitrine.

Rostre aussi long que la tête et le prothorax, épais, assez arqué, pourvu à la base de trois sillons peu profonds et de trois carénes obtuses, lisse en avant. Antennes insérées un peu en avant du milieu du rostre, le funicule de cinq articles, le 1er brun, oblong, presque aussi long que les deux suivants reúnis, les articles 2–5 courts, serrés, transversaux, la massue grosse plus longue que le reste du funicule, ses articles bien détachés, les deux premiers globuleux. Prothorax trapézoidal, plus du double aussi large que long, la base modérément arquée; convexe, la ponctuation et la pubescence trés fines et peu serrées, le bord antérieur étroitement roux. Elytres plus longs que larges, modérément rétrécis en arriére; convexes, obliquement déclives derriére la base, cette derniére finement rebordée, les stries assez fortes et visiblement ponctuées, les interstries subplans, le bord apical étroitement roux. Pattes à pubescence cendrée, les fémurs armés d'une seule épine fine et assez longue; ongles sondés à la base. Longueur, 1.8 millimètres.

Singapore (*Baker*).

Nanophyes insularis sp. nov.

Ferrugineux, le funicule des antennes noirâtre, revêtu d'une courte pubescence claire, peu serrée, ne violant pas le fond brillant des téguments, les côtés de la poitrine revêtus d'une pubescence blanche, longue et serrée.

Rostre épais, peu arqué, aussi long que la tête et le prothorax, tricaréné à la base, lisse, pointillé et brillant en avant. Antennes à scape ferrugineux atteignant juste la base de l'oeil, le funicule foncé formé de cinq articles, le 1er oblong et du double aussi long que large, le 2e moins épais, que le 1er, subconique et aussi long que large, les trois suivants serrés, courts, grossissant un peu, la massue brusque, grosse, plus longue que le reste du funicule, ses articles bien séparés, les deux premiers subspheriques. Prothorax trapézoidal, plus court que large, à ponctuation fine et espacée. Elytres plus longs que larges, modérément rétrécis en arriére, la base briévement relevée et étroitement marginée de brun, le calus huméral saillant, les stries fines, les interstries subconvexes et finement pointillés, la pubescence dorsale formant une fascie oblique, médiane, remontant vers les épaules, peu nette. Fémurs armés d'une seule épine, fine

et assez longue. Angles noirâtres, sondes à la base. Longueur, 1.8 millimètres.

Luzon, Los Baños (*Baker*).

Nanophyes bakeri sp. nov.

Noir brun, les antennes, massue exceptée et les trochanters testacés, la base des fémurs, les tibias et les tarses ferrugineux, revêtu d'une pubescence assez longue, couchée, cendrée et assez dense, les côtés de la poitrine couverts d'une longue et dense pubescence squamuleuse blanche.

Rostre mince, peu arque, plus long que la tête et le prothorax, tricaréné à la base, pointillé en avant. Antennes assez allongées, le funicule de cinq articles, les deux premiers allongés, subégaux, le 3e un peu plus court que le 2e, les 4e et 5e ovoides, plus courts et plus épais, la massue oblongue fusiforme, ses articles contigus, non détachés, les deux premiers coniques. Prothorax plus du double aussi large que long, les côtés presque rectilignes et fortement convergents en avant, la base faiblement arquée; convexe, visiblement quoique peu profondement impressionné transversalement en avant, la ponctuation fine et assez serreé, la pubescence dense. Elytres plus longs que larges, modérément rétrécis en arriére, le calus huméral petit, les stries très fines, les interstries très plans et densément pointillés, la pubescence dense. Pattes à pubescence longue et assez dense; fémurs fortement renflés, armés de quatre épines robustes, l'interne longue, les autres graduellement plus courtes; ongles sondés. Dessous à pubescence espacée dans le milieu, serrée autour des hanchés antérieures et sur le bord des deux premiers segments ventraux, très serrée, blanche, sur les bords de la poitrine. Longueur, 2.7 millimètres.

Mindanao, Surigao (*Baker*).

Nanophyes bellus nom. nov.

Nanophyes testaceicornis HELLER, nom. praeocc.

Brun, le prothorax et le rostre roux, les pattes et les antennes testacées, les fémurs parfois rembrunnis en dessus, revêtu en dessus d'une dense et assez longue pubescence d'un gris jaunâtre, les élytres ornés d'un fascie dénudée postbasale, dentelée, assez large, le dessous revêtu d'une pubescence plus longue cendrée, assez serrée, plus serrée sur les bords de la poitrine. Rostre plus long que la tête et le prothorax, droit et pourvu à la base de plussieurs fines carènes (mâle), arqué et simplement ponctué (femelle), lisse et brillant au sommet, pubescent. An-

tennes médianes, le funicule de cinq articles, les deux premiers égaux et allongés, les suivants globuleux et graduellément plus épais, la massue oblongue, ses articles médiocrement séparés, son 1er article conique et aussi large que long. Prothorax trapézoidal, transversal, ses côtés rectilignes; convexe, sa ponctuation très fine et serrée, sa pubescence dense, orné de chaque côté d'une petite tache médiane de pubescence plus claire. Elytres très convexes, les stries fines, les interstries un peu convexes, plus fortement vers le sommet. Fémurs fortement renflés, armés de cinq épines, l'interne longue; ongles sondés à la base. Longueur, 2.3 millimètres.

Luzon, Province de Zambales (*Baker*).

Nanophyes ligatus Heller (in litt.).

Grand, noir, peu brillant, le scape ferrugineux, les premièrs articles du funicule d'une brun ferrugineux, orné en dessus d'un dessin blanc tranché, formé de poils squamuleux serrés, comprenant sur le prothorax une bande basale sur les ongles postérieurs, prolongée en dessous, une macule oblongue sur le tiers antérieur du 2e interstrie, une bande transversale sur les élytres, un peu au de là de leur milieu, cette bande interrompue à la suture, droite, s'effacant graduellement à partir du 6e interstrie; les points des stries sont pourvus de fins poils blancs bien visibles en avant jusqu'a la bande transversale, en arriére de cette bande les stries et les interstries latéraux sont assez densément pubescents, enfin ou distingue une petite macule sur le milieu de la base du prothorax et de nombreux poils dans ses angles antérieurs. Dessous revêtu de poils plus grossiers, blancs, longs, assez serrés, tres serrés et formant tache sur les côtés de la poitrine et devant les hanches antérieures.

Rostre mince, plus long que la tête et le prothorax, finement ponctué en série à la base (femelle), ou plus court, plus épais, pourvu de cinq carènes et d'autant de sillons à la base, hérisse de courtes soies blanches, droit (mâle). Antennes insérées vers le milieu (femelle) ou le tiers antérieur (mâle) du rostre, le scape atteignant (femelle) ou dépassant (mâle) le bord antérieur de l'œil; funicule de cinq articles, femelle les deux premiers allongés, le 2e un peu plus long que le 1er, les trois suivants oblongs, beaucoup plus longs que larges, les trois articles de la massue bien séparés, gros, le 1er obconique, le 2e subtransversal, le mâle tous les articles plus courts et plus épais. Prothorax transversal, les côtés un peu arqués en arriére, plus fortement, sinués en avant, la base peu arquée; convexe, trés finement ponctué coriacé. Elytres

finement rebordés a la base, les stries fines, les interstries finement ponctués-coriacés et munis en arriére de quelques longs poils blancs verticaux. Pattes pubescentes de cendré, les fémurs fortement renflés et munis de quatre épines, plus fortes chez le mâle; ongles sondés à la base. Pygidium à pubescence très fine et peu serreé. Longueur, 3.1 à 3.3 millimètres.

Singapore (*Baker*).

Nanophyes fulvoapicalis sp. nov.

Mâle.—Noir, assez brillant, les antennes et les tarses ferrugineux, les trochanters testacés, le tiers apical des élytres revêtu d'une dense pubescent jaunâtre, orné en outre de deux fascies transversales de poils blancs, l'une sur le milieu du prothorax prolongée en arriére ou milieu por une linéole jusque sur la base, l'autre un peu en arriére de la base des élytres, sinueuse, remontant presque à la base du 5^{e} interstrie, élargie et prolongée en arriére sur les deux premiers interstries; l'abdomen revêtu d'une fine pubescence cendrée, les côtés de la poitrine d'une pubescence squamuleuse blanche trés serrée (entremélée de quelques poils jaunes) formant tache, une tache semblable sur les hanches anteriéures, les côtés du prothorax grossièrement ponctués et couverts de longs poils blancs et jaunâtres.

Rostre épais, peu arqué, aussi long que la tête et le prothorax, muni à la base de cinq carènes et d'autant de sillons pontués, fins, le sommet brun brillant, sérialement ponctué et pourvu d'un sillon láteral ponctué, n'atteignant pas tout à fait le sommet. Antennes robustes, le funicule de cinq articles, les deux premiers peu allongés et égaux, les suivants serrés, graduellement plus épais, la massue oblongue, ses articles â peine séparés. Yeux entourés de cils blancs. Prothorax trapézoidal, transversal, à ponctuation fine. Elytres nettement rebordés à la base, transversalement assez largement et profondément impressionnes derrière ce rebord, les stries fines, les latérales visiblement ponctuées dans leur milieu, les interstries pointillés coriacés. Pattes pubescentes de cendré, les fémurs fortement renflés et munis de quatre épines; ongles parallèles et sondés à la base. Longueur, 2.6 millimètres.

Singapore (*Baker*).

Pseniclea violacea (Heller).

Nanophyes violacea Heller.

Glabre, brillant, rouge ferrugineux, les élytres violets leur tiers apical rouge.

Rostre à peine aussi long que le prothorax, peu arqué, comprime latéralement à la base, aminci graduellement en avant, en dessus lisse, très finement et éparsément pointillé. Antennes médianes, le 1er article du funicule gros, obconique, assez allongé, les articles suivants très minces, la massue grosse oblongue, aussi longue que le reste du funicule. Tête à ponctuation fine, plus forte et très serrée derrière les yeux, ces derniers contigus en arrière. Prothorax trapézoidal, une fois et demie aussi large que long, la base bisinuée de chaque côté; convexe, à ponctuation fine et espacée. Ecusson petit et arrondi. Elytres très convexes, triangulaires, plus longs que larges, arrondis ensemble au sommet, le calus huméral grand mais peu élevé, munis chacun de 10 rangs de points ronds, peu serrés, médiocres, effacés en arrière, les 8e et 9e rangs effacés en avant vers le calus huméral, le 10e à points grands, profonds, serrès, creusé en sillon en avant, le bord latéral subcaréné. Pattes courtes et robustes; fémurs canaliculés, fortement dentés, rugueux, les points pourvus d'une courte soie squamuleuse claire; tibias fortement arqués à la base, rugueux subsillonnés; tarses courts, le 1er article une fois et demie aussi long que large. Dessous: côtés du prothorax á ponctuation forte et espacèe; métasternum rugueux et finement pubescent au milieu, les bords pourvus de gros points espacés; quatre derniers segments abdominaux lisses et glabres, brillants. Longueur, 2.3 à 2.5 millimètres.

Luzon, Mount Maquiling, Mount Banahao (*Baker*).

Pseniclea castanea sp. nov.

Brun rouge, brillant, les fémurs un peu assombris. Forme de l'espèce précédente dont elle diffère en outre de la coloration par les caracteres suivants: Points des series élytrales plus fins, la 9e série complète, atteignant la base, la 10e à points moins forts, moins creusèe en avant; bords de la poitrine pourvus d'un plus grand nombre de points; antennes plus grêles, le 1er article de funicule plus long. Longueur, 2.3 à 2.5 millimètres.

Mindanao, Iligan, Dapitan (*Baker*).

Idotasia bakeri sp. nov.

Brun rouge, brillant, le prothorax brun noir, les élytres d'un rouge brun clair, les élytres pourvus le long de la base et vers le sommet de quelques grosses squamules jaunâtres, les points du prothorax et des pattes pourvus chacun d'une courte soie squamuleuse jaunâtre, les segments abdominaux munis d'une frange de poils squamuleux jaunâtres assez longs et serrés.

Rostre large, aussi long que le prothorax, ses bords sinués, dilaté latéralement un peu en avant de la base, pourvu de cinq fortes carènes, la médiane droite, entière et la plus élevée, l'externe courte et sinuée, ces carènes separées par des sillons ponctués, densément squamulés et setosulés. Tête très lisse, imponctuée. Prothorax subconique, aussi long que large à la base, les côtés à peine arqués, la base subrectiligne et du double aussi large que le bord antérieur; convexe, couvert de grands points profonds serrés, très serrés et rugueux en avant, moins gros et moins serrés vers la base, le milieu avec une courte carène obtuse et imponctuée. Elytres ovoides, beaucoup plus larges que le prothorax, une fois et un quart aussi longs que larges ensemble, brusquement rétrécis mais peu prolongés vers le sommet; très convexes, leur courbure dorsale continuant celle du prothorax, munis de séries de points fins et très finement squamulés au fond, grossiérement ponctués le long de la base et surtout au sommet, les interstries lisses, le 1er pointillé en avant. Fémurs linéaires, grossiérement ponctués, profondément canaliculés, inermes; tibias carénés, les postérieurs dilatés au milieu de leur bord interne en une large lame triangulaire; soies des corbeilles tarsales et des tarses jaunes. Segment anal pourvu de deux grandes fossettes contigues, males, limitées en arriére par une forte touffe de poils jaunes. Longueur, 3.5 millimètres.

Luzon, Mount Maquiling (*Baker*).

Idotasia semirubra sp. nov.

Forme générale et coloration de l'espèce précédente, mais les élytres ornés chacun de deux petites taches squamuleuses blanches, l'une sur la base du 4^{e} interstrie, l'autre vers le sommet près du bord latéral, munis en outre de quelques grosses squamules blanches le long du 2^{e} interstrie et vers le sommet.

Rostre comme chez l'espèce précédente, mais toutes les carènes courtes atteignant seulement le milieu, ponctué et lisse en avant. Tête lisse. Prothorax faiblement conique, aussi long que large, a ponctuation fine et très espacée, muni de chaque côté derriére le bord antérieur d'un profond sillon oblique n'atteignant pas le milieu. Elytres non ponctués le long de la base, les points des séries très fins sur le disque, devenant gros et serrés vers le sommet, ceux de la 7^{e} série grossiere et serrés sous l'épaule. Tibias postérieurs non dilatés en dedans. Abdomen muni seulement de quelques grosses squamules sur le bord des segments,

les deux premiers segments et le 5e très profondément excavés, glabres et brillants. Longueur, 2.5 millimètres.

Sibuyan (*Baker*).

Lobotrachelus bakeri sp. nov.

Brun noir, les antennes et les tarses testacés, revêtu sur les pattes et en dessous d'une pubescence grossière, squamuleuse, cendrée et serrée, plus grossière et plus serrée sur les bords du prosternum, le dessus à pubescence foncée, peu visible, et orné d'un dessin formé de poils squamuleux d'un blanc jaunâtre couvrant la suture en entier (les poils dirigés obliquement en arriére), formant une courte linéole sur la base des 2e et 3e interstries, une bande sur la base du prothorax (interrompue devant le lobe scutellaire) ; quelques poils plus fins se voient encore sur le bord antérieur du prothorax et sur la marge apicale des élytres, cette dernière est etroitement ferrugineux.

Rostre aussi long que les fémurs antérieurs, d'un brun noir, pointillé et très éparsément pubescent à la base, lisse et roussâtre au sommet. Yeux séparés par une ligne de pubescence. Antennes assez épaisses, le 2e article plus court et beaucoup moins épais que le 1er, un peu plus long que le 3e. Prothorax trapézoidal, du double aussi large que long, convexe, la ponctuation très serrée mais peu profonde. Lobe scutellaire obtus. Elytres triangulaires, peu plus longs que larges ensemble, les stries profondes et ponctuées, les interstries plans, finement ponctués, brillants entre les points. Fémurs inermes, non canaliculés en dessous. Longueur, 2.5 millimètres.

Mâle.—Premier segment ventral déprimé, le segment anal pourvu d'une petite fossette dénudée. Bords de la poitrine couverts de véritables squamules ovales.

Mindanao, Dapitan (*Baker*).

Lobotrachelus minutus sp. nov.

Noir, les antennes et les tarses testacés, revêtu en dessus d'une fine pubescence cendrée, uniformément répartie (plus grossière et plus serrée sur le lobe scutellaire), le dessous et les pattes couverts d'une pubescence squamuleuse grossière blanchâtre, encore plus dense et plus blanche sur les bords de la poitrine et du prosternum.

Rostre roux au sommet, densément squamulé de blanc et assez épais (mâle), ou mince, pourvu seulement de quelques fins poils et de points petits et épars (femelle). Yeux séparés par une ligne

de pubescence. Antennes longues et filiformes, le 1er article du funicule très long, aussi long que les trois suivants réunes, le 2e allongé mais plus court que le 1er, la massue étroite, funiforme. Prothorax trapézoidal, une fois et demie aussi large que long; convexe, légèrement impressionné à la base, de chaque côté du lobe scutellaire, la ponctuation forte et serrée, les points légèrement ocellés émettant chacun un poil couché dirigé en avant, les intervalles entre les points rugueux. Elytres triangulaires, le bord apical ferrugineux, les stries fines et pourvoues d'un rang de poils plus courts et plus fine que ceux des interstries, les poils des interstries légèrement soulevés, disposés en avant sur deux rangs et en arriére sur un seul rang. Fémurs canaliculés et finement dentés en dessous.

Mâle.—Segment anal pourvu d'une grande et profonde fossette densément squamulée sur son bord antérieur (les squamules petites et laciniées), glabre et rugueuse en arriére. Longueur, 1.5 millimètres.

Mindanao, Bukidnon, Tangkulan (*Baker*).

Lobotrachelus suturalis sp. nov.

Mâle.—Noir, les antennes et les tarses testacés, le bord apical des élytres ferrugineux, revêtu sur le rostre, les côtés de la poitrine, du prosternum d'une couche de squamules blanches de neige, sur les pattes et l'abdomen de poils squamuleux grossiers et cendrés, le dessus revêtu de poils foncés et fins et ornés d'un dessin blanc formé sur les élytres de poils allongés, sur le prothorax de poils plus courts, assez serrés, laissant une grande tache médiane denudée, le dessin élytral comprenant une linéole suturale, une courte linéole (formée de deux lignes de poils peu serrés) sur la base des interstries 2 à 7, une linéole sur le milieu des 2e et 3e interstries.

Antennes moyennement épaisses, le 1er article du funicule beaucoup plus épais que le 2e, plus long que les 2e et 3e réunis, le 2e peu plus long que large et à peine plus long que le 3e, la massue oblongue. Prothorax trapézoidal, du double aussi large que long, légèrement déprimé à la base de chaque côté du lobe scutellaire, ce dernier densément pubescent, la ponctuation très serrée, légèrement ocellée, les poils couchés, plus grossiers, squamuleux le long de la base. Elytres triangulaires, á peine plus longs que larges, les stries fortes, les interstries ponctués et rugueux. Fémurs finement dentés et canaliculés à la base; 1er article des tarses plus long que les deux suivants réunis. Seg-

ment anal pourvu d'une fine carène médiane. Longueur, 2.3 millimètres.

Luzon, Mount Maquiling (*Baker*).

Lobotrachelus elongatulus sp. nov.

Mâle.—Rhomboidal, allongé, noir, les antennes et les tarses testacés, le bord apical des élytres étroitement ferrugineux, revêtu en dessus d'une pubescence blanche, alignée sur les interstries, serrée sur la suture, plus grossière et très serrée, squamuleuse sur le bord postérieur du prothorax et le lobe scutellaire, revêtu en dessous de squamules blanches très serrées sur les bords de la poitrine, du prothorax, sur le rostre, linéaires, fines sur les pattes.

Rostre court, beaucoup plus court que les fémurs antérieurs, roux au sommet, densément blanc. Antennes assez courtes, le 2e article beaucoup plus court et moins épais que le 1er. Prothorax seulement un peu plus large que long, les côtés légèrement arqués, convexe, la ponctuation très serrée, rugueuse, la pubescence fine et régulièrement répartie sauf le long de la base. Elytres étroits, á peine plus larges que le prothorax, presque du double aussi longs que larges ensemble, les stries larges, profondes, glabres, les interstries convexes pourvus en avant de deux rangs, en arrière d'un seul rang de poils. Fémurs obsolètement dentés. Segment anal pourvu d'une très grande fossette glabre, brillante et pointillée. Longueur, 2.2 millimètres.

Borneo, Sandakan (*Baker*).

Lobotrachelus luteofasciatus sp. nov.

Noir, les antennes ferrugineuses, les tarses bruns, orné en dessus d'un dessin jaune formé de poils squamuleuse épais, comprenant deux bandes transversales sur le prothorax, l'une sur le bord antérieur, l'autre sur la base, celle-ci dilatée légèrement au milieu, trois fascies transversales sur les élytres, la 1er basale formé de linéoles inégales, la 2e médiane, large, arquée en avant au milieu; prolongée en avant par une linéole sur le 8e interstrie, reliée en arrière à la 3e fascie sur les interstries 6, 7, 8, la 3e fascie apicale, le lobe scutellaire et la suture entièrement jaunes; revêtu en dessous d'une pubescence squamuleuse, jaune sur les bords, d'un gris jaunâtre sur le milieu.

Rostre court, très épais, grossièrement ponctué, fortement caréné à la base, à pubescence très éparse et fine (mâle, femelle). Deux premiers articles du funicule peu allongés, le 1er plus gros

et plus long que le 2e, les suivants globuleux. Prothorax trapézoidal, du double aussi long que large, convexe, brillant, la ponctuation fine et espacée. Lobe scutellaire allongée et aigu, entouré d'un profond sillon glabre. Stries élytrales larges, profondes, ponctuées, les interstries convexes, densément ponctués rugueux. Pattes à pubescence très fine, presque glabres; fémurs densément ponctués-striés, profondément canaliculés en dessous, inermes, tibias droits. Mâle, métasternum et 1er segment ventral déprimés. Longueur, 3.5 à 3.7 millimètres.

Himalaya Oriental (*R. P. Bertrand*), ma collection.

Lobotrachelus himalayanus sp. nov.

Noir, brillant, les antennes ferrugineuses, les tarses bruns, orné en dessus d'un dessin blanc formé de poils fins, comprenant une courte linéole sur le lobe scutellaire, la base de la suture et du 3e interstrie, une courte linéole sur le milieu de la suture et des interstries 2, 3, 4, 5, une courte linéole sur le sommet de la suture, dessous revêtu de poils squamuleux grisâtres, les côtés de la poitrine et une étroite bande dans l'angle du prothorax et des élytres à squamules blanches et très serrées.

Rostre comme chez l'espéce précédente. Deux premiers articles du funicule assez allongés, les suivants graduellement épaisses. Prothorax conique, presque aussi long que large, légèrement étranglé latéralement en avant, à ponctuation fine et espacée. Elytres déprimés autour de l'écusson, les stries larges et profondes, les interstries plans, à peine pointillés. Pattes à ponctuation espacée, les points pourvus de poils squamuleux courts et cendrés; fémurs finement dentés, brièvement sillonnés au sommet. Longueur, 2.7 à 3 millimètres.

Himalaya Oriental (*Bertrand*), ma collection.

Lobotrachelus bertrandi sp. nov.

Mâle.—Noir, presque mat, les antennes testacées, densément revêtu en dessous et sur le rostre de squamules oblongues, blanches, linéaires sur les pattes, orné sur le prothorax d'une fascie apicale, interrompue au milieu et d'une bande basale cendrées, sur les élytres d'une fascie basale étroite prolongée sur la suture presque jusqu'au sommet, cendrées; écusson arrondi et cendré, entouré d'un sillon dénudé; lobe scutellaire presque dénudé.

Rostre assez long. Deux premiers articles du funicule allongés, le 1er le plus long. Prothorax trapézoidal, presque du double aussi large que long, convexe, à ponctuation peu profonde

mais assez grande et très serrée, rugueuse. Elytres peu rétrécis en arrière, le calus huméral saillant, brillant; convexes, déprimés autour de l'écusson, les stries profondes et ponctuées, les interstries subconvexes, rugueux, revêtus d'une très courte pubescence d'un brun foncé. Pattes élancées, les fémurs sillonnés et dentés. Segment anal pourvu d'une grande fossette dénudée. Longueur, 3.2 millimètres.

Himalaya Oriental (*Bertrand*), ma collection.

Lobotrachelus pusillus sp. nov.

Noir, presque mat, les antennes testacées, les tarses et les quatre tibias antérieurs ferrugineux, revêtu en dessus d'une fine pubescence d'un brun fonce, peu visible et de quelques poils fins et gris sur la base des interstries et la suture, revêtu en dessous de squamules blanches serrées, plus serrées sur les bords.

Rostre glabre et éparsément pointille (femelle), ou plus épais et densément squamulé (mâle). Premier article du funicule épais et aussi long que les 2e et 3e réunis, le 2e court et peu plus long que le 3e. Prothorax conique, peu plus large que long; modérément convexe, la ponctuation serrée et ruguleuse. Elytres triangulaires, plus longs que larges, le calus huméral saillant, les stries profondes, les interstries plans et rugueux; lobe scutellaire densément pubescent de cendré. Pattes grêles; fémurs ponctués et finement squamulés, finement dentés, obsolètement canaliculés, tibias grêles et pubescents. Longueur, 1.7 millimètres.

Himalaya Oriental (*Bertrand*), ma collection.

Lobotrachelus parvulus sp. nov.

Mâle.—Noir, les antennes, les tibias antérieurs et les tarses testacés, uniformément revêtu en dessus de poils fins et cendrés, disposés en deux rangs peu réguliers sur chaque interstrie, serrés sur le lobe scutellaire, couvert en dessous de poils squamuleux et blanchâtres, blancs et très sérrés sur le rostre les bords de la poitrine et du prothorax. Prothorax conique, presque aussi long que large, convexe, la ponctuation très fine et très serrée, peu profonde, ruguleuse. Elytres peu plus larges que le prothorax, assez allongés, le calus huméral saillant, les stries larges, munies d'un rang de poils très courts, plus courts et plus fins que ceux des interstries, les interstries plans et à peine plus larges que les stries. Pattes linéaires, grêles, pubescentes de cendré, les fémurs canaliculés et inermes, le 1er

article des tarses plus long que les trois suivants réunis. Longueur, 1.7 millimètres.

Java, ma collection.

Lobotrachelus pectoralis sp. nov.

Mâle.—Noir, brillant, les antennes et les tarses testacés, revêtu en dessus de fines soies squamuleuses couchées cendrées, obliquement dirigées sur la suture, en deux séries régulières sur chaque interstrie, plus courtes et régulièrement réparties sur le prothorax, serrées sur le lobe scutellaire, revêtu en dessous de squamules oblongues d'un blanc de niege, serrées, très serrées, sur le rostre les côtés de la poitrine et du prothorax.

Antennes assez grêles, le 1er article du funicule plus long que les 2e et 3e réunis. Prothorax trapézoidal, plus large que long, légèrement impressionné latéralement en avant, la ponctuation ocellée, mais fine, superficielle et très serrée. Elytres triangulaires, fortement rétrécis en arrière, le calus huméral en forme de ligne élevée lisse et brillante, les sillons larges, profonds et glabres, les interstries peu plus larges que les sillons, plans, brillants, bisérialement ponctués et sétosulés. Fémurs linéaires, rugueux, sétosules, inermes; tibias à pubescence cendrée assez longue. Segment anal occupé par une grande fossette, profonde, ronde, glabre, brillante, pointillée. Longueur, 2.4 millimètres.

Tonkin, Hoa Binh (ma collection).

Lobotrachelus affinis sp. nov.

Noir, les antennes et les tarses testacés, le bord apical des élytres ferrugineux, revêtu en dessous de squamules allongeés blanches, plus serrées sur le rostre et les côtés du prothorax et de la poitrine, revêtu en dessus d'une très courte pubescence d'une brun foncé, et de poils cendrés formant sur les élytres deux fascies légères, l'une basale et large, l'autre médiane raccourcie à ses extrémités, la suture presque entièrement pubescente, le lobe scutellaire blanc, la pubescence régulièrement répartie sur le prothorax mais laissant devant le lobe scutellaire une grande tache dénudée.

Rostre fortement caréné, roux au sommet. Premier article du funicule antennaire aussi long que les 2e et 3e ensemble. Prothorax trapézoidal, du double aussi large que long, convexe, à ponctuation fine et serrée. Elytres ovales triangulaires, peu plus longs que larges ensemble, le calus huméral saillant, les sillons profonds, les interstries rugueux. Pattes allongées,

squamulées; fémurs canaliculés et armés d'une épine assez longue; 1er article des tarses plus long que les trois suivants ensemble. Longueur, 1.7 millimeters.

Cochinchine, Tay-Ninh (ma collection).

Lobotrachelus rufirostris sp. nov.

Femelle.—Noir, les antennes testacées, le rostre rouge, les pattes ferrugineux, revêtu en dessus de poils cendrés, assez raides, alignés, revêtu en dessous de squamules blanches, plus serrées sur les côtés de la poitrine et du prothorax.

Rostre mince, cylindrique, glabre, plus long que le prothorax. Antennes minces, les deux premiers articles allongés, le 1er aussi long que les 2e et 3e réunis. Prothorax conique, presque aussi long que large, à ponctuation superficielle, assez grande, visiblement ocellée et serrée. Elytres triangulaires, fortement rétrécis en arrière, beaucoup plus longs que larges, le calus huméral élevé, en forme de ligne saillante et lisse, les stries ponctuées, les interstries plans, rugueux, leurs poils alignés sur deux rangs en avant, un seul en arrière, le bord apical ferrugineux. Pattes squamulées de cendré, les fémurs armés d'une forte dent; tibias dilatés vers leur sommet; 1er article des tarses plus court que les trois suivants ensemble. Longueur, 2.5 millimètres.

Cochinchine, Tay-Ninh (ma collection).

Semiathe cribricollis sp. nov.

Rouge ferruginuex, le prothorax un peu plus foncé, peu brillant, revêtu en dessus de grosses squamules lancéolées, éparses le long des interstries, serrées et formant une macule allongée sur la base du 3e interstrie, d'un blanc jaunâtre, les pattes et les points du dessous pourvus de soies squamuleuses très courtes.

Rostre plus court que le prothorax, ponctué rugueux, subcaréné et sétulosé seulement à la base, rétréci, lisse et brillant en avant. Antennes courtes, la massue ovale et foncée. Tête rugueusement ponctuée et setulosée. Prothorax trapézoidal, plus large que long, les côtés à peine arqués, la base bisinuée, couvert de points ocellés, très serrés, confluents en rides en avant. Ecusson petit. Elytres ovales triangulaires, plus longs que larges, faiblement comprimés latéralement vers le sommet, les stries fortes et profondes, les interstries plans ponctués rugueux, plus fortement rugueux, convexes et mats vers le sommet. Pattes rugueuses; fémurs linéaires canaliculés seulement à leur base, assez fortement dentés; tibias finement carénés, les antérieurs visiblement arqués. Dessous à ponctuation assez ser-

rée, forte, plus fine et très serrée sur le segment anal, unisérriée sur les 3e et 4e segments ventraux. Longueur, 2.7 millimètres.

Luzon, Mount Maquiling (*Baker*).

Chez cette espèce les yeux ont de fines facettes, les élytres les épaules nulles, le prothorax un lobe basal obtus, peu avancé.

Genus **TELEPHAE** Pascoe [2]

1. Côtés du prothorax pourvus soit d'un tubercule, soit d'une tache squamuleuse qui en tient lieu ..... 2.
   Côtés du prothorax depourvus de tubercule ou de tache squamuleuse spéciale ..... 10.
2. Prosternum muni de deux tubercules ou d'une lamelle derriére les hanches antérieures ..... 3.
   Prosternum simple derriére les hanches antérieures ..... 5.
3. Tubercule latéral du prothorax saillant, arrondi et corné ..... 4.
   A même tubercule peu saillant, son bord postérieur trés oblique en arriére ..... **T. obtusata sp. nov.**
4. Pubescence dorsale jaunâtre formant trois fascies sur les élytres et une grande tache sur les angles postérieurs du prothorax. **T. ornata sp. nov.**
   Pubescence dorsale grise, formant deux fascies sur les éytres. **T. griseofasciata sp. nov.**
5. Tubercules latéraux du prothorax bien visibles de haut ..... 7.
   Ces mêmes tubercules visibles seulement de profil ou remplacés par une tache squamuleuse ..... 6.
6. Pattes rouges ..... **T. minuta sp. nov.**
   Pattes foncées ..... **T. carinirostris sp. nov.**
7. Tubercules du prothorax saillants, arrondis au sommet ..... 8.
   Ces mêmes tubercules obtus, plus ou moins allongés ..... 9.
8. Pubescence dorsale longue, uniforme, cendré ..... **T. grisea sp. nov.**
   Pubescence dorsale jaunâtre formant deux fascies sur les élytres. **T. ferruginipes sp. nov.**
9. Elytres ornés de nombreuses linéoles jaunes et tranchées. **T. lineolata sp. nov.**
   Pubescence élytrale d'un cendré jaunâtre, irréguliere, les linéoles mal definies ..... **T. striata p. nov.**
10. Antennes noires ..... **T. nigricornis sp. nov.**
    Antennes ferrugineuses ou testacées ..... 11.
11. Pubescence dorsale d'un beau brun d'ocre formant de nombreuses taches sur le prothorax (10) et sur les élytres ..... **T. maculithorax sp. nov.**
    Pubescence dorsale cendrée ou jaunâtre ..... 12.
12. Elytres ornés de deux fascies cendrées ..... **T. pusilla sp. nov.**
    Pas de fascie sur les élytres ..... **T. neglecta sp. nov.**

Telephae ornata sp. nov.

Noir brun, less tibias ferrugineux, les antennes et les tarses testacées, revêtu en dessous de poils squamuleux jaunâtres,

[2] Les nombreuses espèces décrites ici pourront être differenciées ainsi.

régulièrement répartés et assez serrés, revêtu en dessus d'une pubescence squamuleuse d'un brun foncé et jaune, cette dernière formant sur le prothorax une grande tache rectangulaire sur les angles postérieurs, une tache allongée, latérale, moins nette, sur les côtés en avant, une étroite ligne médiane n'atteignant pas la base; le dessin jaune est composé sur les élytres de linéoles formant une fascie basale, couvrant le calus huméral en avant mais interrompue sur le 6e interstrie, d'une fascie ondulée vers le milieu, interrompue sur les 4e et 6e interstries et n'atteignant pas les bords latéraux, la linéole suturale placée plus en arrière que les linéoles voisines, enfin une fascie antéapicale droite, entre les cinquièmes interstries; la linéole basale de la suture est longue et en couvre le tiers antérieur.

Rostre brun, ponctué-striolé jusqu'a l'insertion antennaire, ferrugineux et brillant en avant, la carène basale obtus. Antennes courtes, les articles du funicule serrés et graduellement épaisses, la massue grosse, ovale et foncée. Prothorax presque du double aussi large que long, les côtés modérément arqués convergents en avant des tubercules, convexe, la ligne médiane un peu élevée, la ponctuation assez forte et très serrée, les tubercules latéraux saillants, arrondis au sommet et squamulés, jaunes. Ecusson arrondi, densément pubescent, jaune, entouré d'un sillon. Elytres en demi-ovale, le calus huméral large, élevé, jaune en avant, brun en arrière; modérement convexes, légèrement déprimés le long de la base; stries étroites, profondes; interstries larges, plans, leurs soies squamuleuses disposées sur deux ou trois rangs assez réguliers; bord apical étroitement roux et translucide. Pattes pubescentes de jaune. Canal rostral profond, terminé entre les hanches antérieures. Prosternum muni de chaque côté d'un petit tubercule derrière les hanches anterieures.

Longueur, 3.2 á 3.5 millimètres.

Borneo, Sandakan (*Baker*).

Telephae ornata var. diffusa var. nov.

Cette variété diffère de la forme typique par le revêtement formé de poils squamuleux bruns et gris jaunâtres; ces derniérs remplacent les poils squamuleux jaunes de la forme typique et le dessin qu'elles forment est moins tranché; en outre la massue antennaire est rousse comme le reste des antennes.

Même provenance.

Telephae obtusata sp. nov.

Oblong, brun, les pattes et le rostre ferrugineux, les antennes et les tarses testacées, revêtu d'une fine pubescence couchée

brune et cendrée, la pubescence cendrée formant sur les élytres une large fascie basale, une deuxième fascie postmédiane, une troisième apicale, la suture presque entièrement cendrée.

Rostre ponctué strié latéralement et caréné au milieu à la base, lisse en avant. Tête à peu près glabre, à ponctuation fine et serrée. Prothorax très peu plus court que large à la base, les côtés un peu divergents de la base jusqu'aux tubercules latéraux, puis peu arqués mais assez fortement convergents en avant, la base deux fois et demie aussi large que le bord antérieur, les tubercules latéraux squamulés, médiocrement saillants, leur bord latéral trés oblique en arrière, coupé perpendiculairement en avant; convexe, la ligne médiane un peu élevée, la ponctuation très serrée, la pubescence cendrée dirigée transversalement vers la ligne médiane, plus serrée vers les bords et laissant de chaque côté de la ligne médiane une bande presque glabre. Ecusson arrondi, cendré, entouré d'un sillon. Elytres en demi ovale, le calus huméral grand et assez saillant; modérément convexes, légèrement impressionnés autour de l'ecusson, les stries profondes, devenant plus étroites en arrière, les interstries larges, plans, finement rugueux; bord apical étroitement roux et translucide. Pattes et dessous revêtus d'une très fine pubescence peu serrée d'un gris flave. Canal rostral profond devant les hanches antérieures; prosternum pourvu d'une lamelle assez élevée, de chaque côte, derrière les hanches antérieures. Longueur, 2.5 millimètres.

Palawan, Puerto Princesa. Singapore (*Baker*).

Telephae griseofasciata sp. nov.

Noir, peu brillant, les antennes et les tarses roux, revêtu d'une fine pubescence brune et cendrée, la pubescence cendrée formant sur les élytres une fascie basale et une fascie médiane remontant en avant à partir de 6^{e} interstrie, la suture cendrée exceptée avant le milieu; bord apical étroitement ferrugineux.

Rostre ponctué et caréné à la base, lisse, roux, brillant en avant. Prothorax fortement transversal, plus étroit en avant qu'à la base, les tubercules latéraux saillant, arrondis à leur sommet, cornés, cendrés; modérément convexe, la ponctuation forte, serrée, les points légèrement pupillés, la pubescence cendrée, presque nulle au milieu, plus abondante sur les bords, dirigée vers le milieu. Ecusson ovale, cendré, entouré d'un sillon. Elytres en demi ovale, le calus huméral saillant; convexes, obliquement déclives vers la base; stries profondes; intèrstries larges et plans, finement rugueux. Pattes et dessous a très fine pubescence cen-

drée. Prosternum pourvu d'une lamelle assez élevée de chaque côté, derrière les hanches antérieures. Longueur, 2.2 millimètres.

Borneo, Sandakan (*Baker*).

Telephae carinirostris sp. nov.

Oblong, noir brun, les tarses ferrugineux, les antennes et les tibias testacés, revêtu en dessus d'une pubescence cendrée formant sur les élytres deux fascies, l'une basale, l'autre médiane, la suture pubescente sur la moitié apicale et son tiers antérieur, le 1er interstrie pubescent au sommet.

Rostre muni d'une carène vive jusqu'à l'insertion antennaire, ponctué latéralement à la base, ferrugineux, lisse en avant. Prothorax transversal, les côtés peu arqués dans leur moitié postérieure, assez fortement rétrécis sinués en avant, les angles postérieurs presque droits; modérément convexe, plus fortement le long de la ligne médiane, la ponctuation serrée et un peu rugueuse, les tubercules latéraux remplacés par une tache squamuleuse couvrant le tiers postérieur, la pubescence cendrée fine et éparse, un peu plus serrée dans le milieu et sur les bords. Ecusson arrondi, cendré, entouré d'un sillon. Elytres un peu plus larges que le prothorax, une fois un tiers aussi longs que larges ensemble, les épaules obliques, le calus huméral peu marqué; modérément convexes, obliquement déclives en avant, cette déclivité cendrée, les sillons fins et ponctués, les interstries plans, finement ponctués ridés. Pattes et dessous à pubescence cendrée, plus fine sur les pattes; fémurs antérieurs fortement renflés, les tibias antérieurs arqués et leurs bords parallèles. Prosternum concave. Longueur, 2.5 millimètres.

Mindanao, Butuan (*Baker*).

Cette espèce doit être voisine de *T. ursula* Heller mais les élytres sont plus longs, plus parallèles sur les côtés et le dessin est différent.

Telephae minuta sp. nov.

Oblong, noir, les pattes et les antennes d'un rouge jaune, la pubescence cendrée, fine, formant sur les élytres trois fascies, une basale, une postmédiane complete et fortement dentelée, une apicale interrompue sur les 3e, 6e, 7e interstries.

Rostre rouge, non caréné mais seulement pointillé et pourvu latéralement d'un court sillon de chaque côte à la base. Prothorax presque du double aussi large que long, les côtés légèrement divergents en avant et rectilignes sur leur tiers

postérieur, puis graduellement convergents et à peu près rectilignes, les tubercules latéraux très peu visibles de dessus formant un simple angle obtus, bien distincts, en arête squamulée, vers de profil; modérément convexe, densément ponctué, la pubescence cendrée fine et régulièrement répartie. Ecusson petit, cendré. Elytres une fois et un tiers aussi longs que larges, les épaules presque effacées, le calus huméral à peine indiqué; régulièrement convexes, les stries fines, les interstries plans. Pattes et dessous à fine pubescence cendrée. Fémurs antérieurs fortement renflés; tibias normaux. Prosternum concave. Longueur, 1.5 à 1.7 millimètres.

Luzon, Mount Maquiling. Singapore (*Baker*).

Telephae grisea sp. nov.

Oblong, brun, les pattes et les antennes ferrugineuses, revêtu en dessus et en dessous d'une pubescence cendrée, couchée, assez serrée, uniformément répartie, un peu plus serrée cependant sur la suture.

Rostre ferrugineux, squamulé à la base, latéralement ponctué-striolé presque jusqu'au sommet, en dessus caréné à la base. Tête ferrugineuse, ponctuée, finement pubescente en avant. Prothorax un peu moins long que large, les côtés rectilignes en arrière des tubercules latéraux, les angles postérieurs droits, modérément rétréci en avant, les tubercules latéraux saillants, arrondis au sommet, cornés, leur base prolongée en arrière jusqu'à la base du prothorax; convexe, obliquement et assez fortement relevé des bords au milieu, la ponctuation serrée et finement rugueuse, la pubescence assez fournie et transversalement dirigée vers la ligne médiane. Ecusson oblong, petit, pubescent. Elytres en demi ovale, de un tiers plus longs que larges ensemble, les épaules obliques, le calus huméral peu marqué; régulièrement et assez fortement convexes, les stries profondes, glabres, leurs points bien visibles et entamant les interstries, les interstries plans, ponctués, munis chacun de deux ou trois rangs de poils. Pattes pubescentes, les tibias étroits, les tarses grêles, le 1er article plus long que les deux suivants réunis. Prosternum dépourvu de tubercule derrière les hanches antérieures. Longueur, 2.1 à 2.3 millimètres.

Borneo, Sandakan (*Baker*).

Telephae ferruginipes sp. nov.

Oblong, brun noir, les élytres, les antennes, les pattes (fémurs antérieurs exceptés) ferrugineux, les élytres ornés de deux

fascies transversales de poils squamuleux jaunâtres, l'une basale, l'autre postmédiane, pourvus en outre d'une linéole suturale anteapicale et d'une tres courte linéole sur le 4e interstrie un peu avant le sommet, le dessous revêtu de squamules linéaires grisâtres assez serrées.

Rostre latéralement comprimé, ponctué striolé à la base, caréné en dessus, lisse et brun en avant. Tête densément ponctuée. Prothorax presque du double aussi large que long, régulièrement et assez fortement arqué sur les côtés, les angles postérieurs obtusément arrondis, les tubercules latéraux saillants, cornés, arrondis au sommet; régulièrement et assez fortement convexe, la ponctuation serrée, confluente en rides, la pubescence peu serrée formant une large bande sur les côtés et une tache devant l'écusson. Ecusson petit, pubescent, entouré d'un sillon. Elytres en demi ovale, les épaules très obliques et arrondies, le calus huméral faible; convexes, déprimés autour de l'écusson, les stries étroites, profondes, glabres, leurs points indistincts, les interstries plans, ruguleux, munis de deux ou trois rangs de poils squamuleux en partie brun foncé et en partie jaunâtres. Pattès à pubescence fine et éparse. Prosternum dépourvu de tubercule derrière les hanches antérieures. Longueur, 2.2 millimètres.

Borneo, Sandakan (*Baker*).

Telephae lineolata sp. nov.

Oblong, brun noir, les antennes et les tarses testacés, revêtu en dessus d'une pubescence brune et jaune, cette dernière formant sur les élytres deux fascies transversales formées de linéoles très inégales la 1ere basale, la 2e médiane, les linéole de la 1ere plus courtes sur les interstries pairs que sur les impairs, celle de la suture couvrant son tiers antérieur, la fascie médiane très ondulée, sa linéole suturale la plus longue, les 2e, 4e, 9e interstries ont en outre une linéole près du sommet.

Rostre caréné et ponctué à la base, roux au sommet. Prothorax un peu moins long que large, les côtés arrondis, brusquement et assez largement rétréci resserré en avant; les angles postérieurs obtus, les tubercules latéraux squamulés, allongés en forme de crête, très peu saillants vers de haut, saillants latéralement vers de profil, modérément convexe, la ponctuation serrée, la ligne médiane élevée, la pubescence jaune éparse sur le disque, plus serrée sur la ligne médiane et les angles. Ecusson arrondi, pubescent, jaune, placé au centre d'une petite dépression et entouré d'un sillon. Elytres en demi

ovale, visiblement plus longs que larges, les épaules peu obliques, le calus huméral assez élevé; convexes, les stries étroites et profondes, les interstries plans, rugueux. Pattes et dessous à pubescence jaunâtre plus courte et plus fine que celle du dessus. Longueur, 2.7 à 3 millimètres.

Borneo, Sandakan (*Baker*).

Telephae striata sp. nov.

Oblong, brun noir, les antennes et les tarses testacés, revêtu en dessus d'une pubescence squamuleuse cendrée jaunâtre irrégulière et assez serrée et d'une pubescence d'un brun foncé formant sur les élytres deux fascies très irrégulières, étroites, la 1ere vers le tiers antérieur, la 2e vers le tiers postérieur, le 9e interstrie brun vers le sommet.

Rostre brun, ponctué et caréné à la base. Prothorax à peine plus large que long, les côtés subparallèles jusqu'au tiers anterieur, puis assez fortement rétrécis sinués en dedans, les tubercules latéraux modérément saillants, squamulés, leur bord postérieur oblique; modérément convexe, la ponctuation assez forte et serrée en arrière, fine en avant, la pubescence assez serrée, plus cendrée dans les angles postérieurs, laissant deux bandes dénudées étroites en arrière, réunies et formant une large bande mediane à partir du milieu. Ecusson, ovale, cendré, entouré d'un sillon. Elytres en demi ovale, peu plus larges que le prothorax, au moins une fois et demie aussi longs que larges ensemble, les épaules très obliques, le calus huméral très élevé et cendré; convexes, les stries profondes, peu distinctement ponctuées, les interstries plans, rugueux, le bord apical étroitement ferrugineux. Pattes revêtues d'une pubescence cendrée fine mais serrée, les tibias ferrugineux. Dessous à pubescence squamuleuse cendrée assez dense. Longueur, 2.5 millimètres.

Borneo, Sandakan (*Baker*).

Telephae pusilla sp. nov.

Ovale, brun noir, les pattes et les antennes d'un rouge ferrugineux, la pubescence cendrée dorsale fine, formant cinq taches sur le prothorax, trois basales et deux antérieures plus petites, deux fascies sur les élytres, l'une basale, fortement prolongée sur les deux premiers et la suture et par suite étroitement separée de la 2e, cette dernière médiane, la suture avec une linéole vers le sommet.

Rostre foncé, caréné, ponctué et pluristriolé à la base, ferrugineux, pointillé et brillant au sommet. Prothorax transversal, modérément arqué sur les côtés, fortement rétréce et un peu étranglé latéralement en avant, sans tubercule ni tache squamuleuse spéciale, peu convexe, un peu relevé le long de la ligne médiane, la ponctuation serrée et granuleuse, la tache basale et médiane plus petite que les latérales. Ecusson arrondi, cendré, entouré d'un sillon. Elytres en demi ovale, un peu plus longs que larges, les épaules brièvement arrondies, le calus huméral indistinct; modérément convexes, profondément déprimés le long de la suture en avant, les stries fines, les interstries plans, finement ponctués granulés. Dessous et pattes à pubescence cendrée fine et courte. Fémurs antérieurs peu renflés, presque linéaires; tibias antérieurs modérément arqués, faiblement élargis dans leur moitié apicale. Prosternum légèrement concave. Les fémurs antérieurs sont seulement aussi larges que les postérieurs. Longueur, 1.6 millimètres.

Mindanao, Davao (*Baker*).

Telephae nigricornis sp. nov.

Noir, revêtu de dessus d'une pubescence excessivement courte mate d'une brun foncé et orné sur les élytres de courtes linéoles blanches: deux sur la suture, l'antérieure postscutellaire, la deuxième médiane, une sur la base des 2e et 3e interstries, une vers le milieu du 4e.

Rostre noir, gros, court, à la base finement caréné au milieu, finement ponctué striolé latéralement, lisse et brillant en avant. Antennes noirâtres, foncées. Prothorax tranversal, les côtés subparallèles de la base au milieu, fortement rétrécis sinués en avant, sans tubercule ni tache squamuleuse particulière, les angles postérieurs presque droits; modérément convexe, largement mais peu profondément impressionné transversalement en avant, la ponctuation serrée et granuleuse, la pubescence mate et assez dense. Ecusson enfoncé, arrondi, à pubescence mate. Elytres en demi ovale, un peu plus longs que larges, les épaules arrondies, les calus huméral assez élevé, arrondi, rugueux; moyennement convexes, fortement impressionnés autour de l'ecusson, les stries ponctués, les interstries plans et fortement rugueux, la 9e strie entière et creusée sous l'épaule, les linéoles claires de la suture séparées par des taches d'un brun noir, foncées. Pattes et dessous revêtus d'une fine pubescence cen-

drée. Fémurs antérieurs assez fortement renflés, visiblement plus épais que les postérieurs, les tibias antérieurs fortement arqués. Prosternum largement et profondément canaliculé devant les hanches antérieures. Longueur, 2 millimètres.

Singapore (*Baker*).

Telephae neglecta sp. nov.

Noir brun, les antennes, les tarses testacés, les tibias ferrugineux, la pubescence dorsale fine, très éparse, jaune, formant trois linéoles sur la suture, la médiane la plus longue, l'apicale très courte, une courte linéole sur la base des interstries 2e, 3e, 4e; bord apical des élytres non explané, étroitement ferrugineux.

Rostre épais, densément ponctué striole à la base, même en dessus, à ponctuation plus fine et moins serrée en avant. Prothorax du double aussi large que long, les côtés subparallèles de la base en milieu, fortement rétrécis sinués en avant, sans trace de tubercule ni de tache squamuleuse, les angles postérieurs largement arrondis; peu convexe, un peu relevé le long de la ligne médiane, largement mais peu profondément impressionné transversalement derrière le bord antérieur, couvert d'une ponctuation fine, très serrée, un peu granuleuse, la pubescence brune peu visible, la pubescence jaune formant seulement deux taches légères de chaque côté, une basale, une médiane petite et arrondie. Ecusson arrondi, pubescent, entouré d'un sillon. Elytres en triangle curviligne, peu plus longs que larges ensemble, leur plus grande largeur un peu en arrière des épaules, ces dernières arrondies; peu convexes, largement et profondément déprimés le long de la suture, les stries fines, les 7e et 8e n'atteignant pas la base, la 9e fortement creusée sous l'épaule, les interstries plans, couverts de très petits granules très serrés. Dessous revêtu de très courtes soies fines, cendrées; pubescence des pattes extrèmement fine et cendrée. Fémurs antérieurs très peu renflés; tibias antérieurs modérément arqués, leurs bords parallèles. Prosternum légèrement concave en avant des hanches. Longueur, 2.5 millimètres.

Borneo, Sandakan (*Baker*).

L'un des exemplaires a une courte linéole jaune sur le milieu des 2e, 3e, et 4e interstries et les deux taches latérales du prothorax sont reliées entre elles et forment une etroite bande latérale.

Telephae maculithorax sp. nov.

Noir brun, les antennes, les tibias et les tarses ferrugineux, revêtu en dessus d'une pubescence squamuleuse d'un rouge d'ocre

formant dix taches sur le prothorax, trois larges fascies sur les élytres, très irrégulières, alternant avec deux fascies dénudées, noires, plus étroites, incomplétes, les fascies claires reliées sur les côtés, la linéole médiane de la suture cendrée-rougeâtre et placée en arriére des linéoles des interstries adjacents.

Rostre brun rouge, à la base finement caréné au milieu, ponctué-striolé latéralement, squamulé, en avant pointillé et brillant. Prothorax un peu plus large que long, les côtes modérément arqués, rétrécis sinués dans leur tiers antérieur, sans tubercule ni tache squamuleuse particulière, les angles postérieurs obtusément arrondis; assez fortement convexe, la ligne médiane élevée, la ponctuation serrée, les taches squamuleuses (3, 4, 1, 2) grandes, les taches denudées irrégulières et moins grandes. Ecusson densément squamulé, entouré d'un sillon. Elytres un peu plus longs que larges, le calus huméral grand, élevé et densément pubescent; convexes, légèrement déprimés le long de la suture en avant, les stries ponctuées, les interstries plans, finement ponctués. Pattes et dessous à pubescence plus fine mais de même coloration que celle du dessus. Fémurs antérieurs modérément renflés; tibias antérieurs arqués, leurs bords paralléles. Prosternum profondément canaliculé en avant, pourvu derrière les hanches antérieures d'une lamelle en forme de croissant, ses extrémités en tubercules aigues et densément pubescents. Longueur, 2.5 millimètres.

Borneo, Sandakan (*Baker*).

Mecysmoderes luzonicus sp. nov.

Rouge ferrugineux, les élytres plus clairs, glabre en dessus, la suture seule pourvu d'une ligne de squamules claires de chaque côté de la carène scutellaire, pourvu en dessous de quelques squamules d'un blanc jaunâtre sur le milieu du metasternum, les points des côtés pourvus d'une soie excessivement fine et courte.

Rostre mince, beaucoup plus long que la tête et le prothorax, à la base superficiellement ponctué striolé et presque mat, en avant lisse pointillé, brillant. Antennes fines et courtes, le 1er article du funicule obconique, le 2^{e} plus court, oblong, les suivants très courts et serrés, la massue ovale oblongue. Prothorax subtrapézoidal, beaucoup plus large que long, brièvement contracté en avant, convexe, couvert sur les côtés de points profonds, au milieu de fins sillons superficiels séparés par d'étroites et obtuses carènes sinueuses, la carène médiane assez vive et entière prolongée en arrière sur la suture presque jusqu'au

milieu. Elytres courts, le calus huméral peu saillant, les sillons larges, leurs points entamant les interstries, les interstries pas plus larges que les stries, convexes, subcarénés particulièrement en arrière. Pattes courtes, les fémurs munis d'une petite dent, les postérieurs fortement épaisses et beaucoup plus épais que les autres; tarses trés courts, le 1er article un peu plus long que large. Dessous à ponctuation forte et espacèe sur la poitrine et le 1er segment ventral, très fine et uniseriée sur les 3^{e} et 4^{e} segments. Canal rostral peu profond terminé sur le mésosternum. Longueur, 1.5 millimètres.

Luzon, Mount Maquiling (*Baker*).

DIPTERA OF MEDICAL AND VETERINARY IMPORTANCE, II

THE MORE IMPORTANT BLOWFLIES, CALLIPHORINÆ

By W. S. PATTON

Of Edinburgh University

In a previous paper [1] I gave an account of my studies of the types of some Muscinæ of medical and veterinary importance. In the present paper I shall deal with the more important blowflies, the Calliphorinæ.

Genus **CALLIPHORA** Robineau-Desvoidy

This genus is usually divided into a number of subgenera on the characters of the epistome, the hairiness or otherwise of the eyes and squamæ, and the number and arrangement of the sternopleural bristles. Johnston and Hardy have recently given the following key to some of the genera:

1. Eyes bare..... 2.
   Eyes hairy..... 3.
2. Epistome conspicuously protruding..... **Anastellorrhina.**
   Epistome scarcely if at all protruding..... **Calliphora.**
3. Epistome scarcely if at all protruding..... **Neocalliphora.**

As there are many intermediate forms with respect to the characters used in this key, and as the species are at present very imperfectly understood, I consider it is best in the meantime to include all the species under the genus *Calliphora*. Hairiness or otherwise of the eyes is a weak character on which to base genera in the Diptera.

The genus *Calliphora* in this wide sense may be defined as follows:

The eyes of the male are as a rule closely approximated, and either bare or hairy, those of the female widely separated, and the front may be equal to the width of the eye. There are nearly always two strongly developed decumbent parafrontal bristles; the parafacials often have two silky yellow spots. The

[1] Philip. Journ. Sci. 27 (1925) 177–200.

lower part of the face and also the cheeks are densely hairy, the hairs long and either dark or bright red, forming a long beard. The third antennal segment is about four and a half times the length of the second, and the apical fifth or third of the arista may be bare. The epistome in some species is broad and prominent (*Anastellorrhina*), or in others normal (*Neocalliphora*). The palpi are relatively small and in most of the species yellow and narrowly club-shaped. The thoracic chætotaxy is as follows: Humeral 4, posthumeral 2, presutural 2, notopleural 2, supra-alar 2, post-alar 2, intra-alar 2 or 3, dorsocentral 6 or 7 (3, sometimes 4, in front of the suture and 3 behind it), acrostical 5 (2 in front and 3 behind the suture). Sternopleural bristles variable, usually arranged 2 : 1; in a few 1 : 1. Pleuræ densely covered with long hairs. Stigmata and bases of wings in some species bright yellow. The venation similar to that of the species of *Musca;* bend of vein M_{1+2} turns up with a sharp angle and has a shallow bend as it joins the margin of the wing a little behind vein R_{4+5}; mediocubital cross vein joins vein M_{1+2} close to the bend; vein R_{4+5} has small bristles on both the surfaces at the base. Squamæ with long hairs sparsely scattered on the dorsal surface and not as a rule reaching the margin. The following notes on some of the species may be of use:

Calliphora erythrocephala Meigen.

Calliphora vomitoria Linnæus.

These are the two common European blowflies; in the former the cheeks are red with black hairs, in the latter black with red hairs. *Calliphora erythrocephala* is recorded from Australia, and both species are not uncommon in the hill stations in North India.

Calliphora aucta Walker.

This is also an Indian species and is found in the hill stations in North India, and in Burma; the cheeks of this species are black with black hairs and the mesothoracic stigmata are dark brown; the color of the abdomen is similar to that of *vomitoria.*

Calliphora fulviceps v. d. Wulp.

A large species, found in the mountainous regions of Java, Sumatra, and Borneo; it can be easily recognized by its bright red cheeks with long red hairs and bright orange stigmata.

Calliphora quadrimaculata Swederus.

Calliphora sacra Fabricius.
Calliphora dasyopthalma Macquart.
Calliphora testaceifacies Macquart.
Calliphora violacea Walker.

A common Tasmanian blowfly; it may possibly be found in parts of Australia also. It can be recognized by its hairy eyes, yellow stigmata, and bases of wings. It is not an important blowfly and, as far as I am aware, does not deposit its eggs in soiled wool. The synonyms noted above are based on the examination of types.

Calliphora dispar Macquart.

Calliphora pubescens Macquart.
Calliphora ruficornis Walker.

Not a common blowfly, but Doctor Ferguson recently sent me a number of specimens from Sydney. I have compared them with Macquart's type, a male, and find they are identical. The type of *C. dispar* is a female of *C. pubescens* and, as it is the older name, it must be used instead of *pubescens*.

Calliphora hyalipennis Macquart.

Calliphora ochracea Schiner.

This is the well-known reddish brown blowfly of Australia. It has been placed in the genus *Neocalliphora* by Brauer and Bergenstamm and in the genus *Adichosia* by Surcouf. I note that Johnston and Hardy include *hyalipennis* as a distinct species in the genus *Neocalliphora;* the types of *hyalipennis* are typical specimens of *ochracea* and, as the former is the older name, it must replace the latter.

Calliphora stygia Fabricius.

Calliphora australis Boisduval nec Macquart.
Calliphora villosa Robineau-Desvoidy.
Calliphora laemica Walker.
Calliphora rufipes Macquart.

This is the common sheep-maggot fly of Australia, where it is known as the golden-haired blowfly. It has been placed in the genus *Neopollenia* by Brauer, in *Tricocalliphora* and *Paracalliphora* by Townsend, and in *Proekon* by Surcouf. It is the species named by Macquart *Lucilia rufipes,* as was correctly determined by Brauer; *Anastellorrhina bicolor* Bigot is not this species, as noted by Johnston and Hardy, but is *C. augur*.

Calliphora tibialis Macquart.

This is smaller but somewhat similar to *C. stygia;* the thorax is not so slate blue but is dark gray; the abdomen is, however, very similar; the first abdominal tergite is darker than in *stygia,* the legs are dark, whereas in *stygia* the femora and tibiæ are yellow; the male has no large facetted area as has that of *stygia.* I have compared with Macquart's type a number of specimens sent me by Mr. Hill and Doctor Ferguson and find they are identical. Johnston and Hardy place this species in the genus *Anastellorrhina* Bigot, and Townsend places it in the genus *Paracalliphora.*

Calliphora hilli sp. nov.

Male.—Front about one-eighth to one-ninth the width of eye; parafacials and cheeks grayish yellow with yellow hairs. Eyes without a large facetted area as in *C. stygia.* First and second antennal segments dark orange, third segment mouse gray; palps yellow, small, and slightly club-shaped. Thorax and abdomen very similar to those of *C. stygia;* stigmata light orange; femora and tibiæ of all legs light orange, all tarsi dark. I have not seen the female. As I was unable to find any type or named specimen of this species in any of the collections I examined, I consider it is new and have much pleasure in naming it for Mr. Hill who has added so much to our knowledge of the Diptera of medical and veterinary importance of Australia. Three of the specimens I have seen were collected by Mr. Hill from Bamawm, Victoria, and the fourth from Seaford.

Calliphora augur Linnæus.

Calliphora lateralis Macquart.
Calliphora oceaniae Robineau-Desvoidy.
Calliphora dorsalis Walker.
Calliphora bicolor Bigot.
Calliphora dichromata Bigot.
Calliphora xanthuria Bigot.
Calliphora selasoma Erichson.

This is another widely distributed Australian sheep-maggot fly; it, like *C. stygia,* has been placed in several genera. Johnston and Hardy include among its synonyms *rufiventris* Macquart and *rufiventris* Bigot. I was unable to find any types or named specimens of either of these species in Paris or in Bigot's collection of Calliphorinæ; the names would best be deleted from the literature. I also note that these authors include *lateralis* Macquart as a synonym of *stygia* and of *augur.* I

may point out that it is a synonym of *augur*. Bigot placed *augur* in the genus *Phumosia*, naming it *xanthuria*, the type of which is a typical specimen of *C. augur*. I consider that the type of *Phumosia dichromata* Bigot, a male, is a small specimen of *augur;* it differs from the typical *augur* in some slight details.

I may point out that the *Calliphora rufipes* of Macquart is probably the South American species *segmentaria*. I am unable to be certain of the identity of *C. tessellata* Macquart, as the type is in a very bad state of preservation and is now a mere shell; it is a bluish green species and I am nearly certain it is another specimen of *C. pubescens*. I could find no type or named specimen of *Pollenia viridiventris;* but *tasmanensis* is a good species of this genus and Doctor Ferguson sent me a specimen recently. I have already noted that *Calliphora aureopunctata* and *C. aureonotata* are species of *Onesia*. I was unable to find any type or named specimen of *C. clausa* Macquart; the name is best deleted from the literature as unrecognizable.

Calliphora croceipalpis Jaennicke.

Calliphora vicarians Schiner.
Calliphora parasacra Speiser.

This is the common Ethiopian species and is found in the mountainous regions of East Africa.

The following key to the more important Australian species of the genus *Calliphora* sens. lat. may be of some use in the identification of species:

Key to the more important Australian species of the genus Calliphora sens. lat.

1. Eyes hairy ..... 2.
   Eyes bare ..... 3.
2. Large bluish black species with bright yellow stigmata and bases of wings. (Tasmania.) ..... C. quadrimaculata Swederus.
   Large golden yellow species with long yellow hairs; wings yellowish at their bases ..... C. hyalipennis Macquart.
3. Large bluish or bluish green species ..... 4.
   Either large or medium-sized golden yellow species with slate blue or dark gray thorax. Abdomen either orange with blue stripes and bands, or golden yellow with bronzy sheen ..... 5.
4. Cheeks red with black hairs. Front of male very narrow. Abdomen with shimmering white patches ..... C. erythrocephala Meigen.
   Cheeks dark gray with black hairs. Eyes of male well separated. Abdomen with white pollen at sides and markedly green toward the apex. C. dispar Macquart.

5. Either large or medium-sized species. All femora and tibiæ light orange, all tarsi dark gray or blackish..... 6.
   Medium-sized species. Thorax dark bluish gray with two narrow admedian presutural stripes. Abdomen golden yellow with some bronzy sheen. All legs dark brown to black..... **C. tibialis** Macquart.
6. Large golden-haired species. Eyes of male meeting in the middle line with a well-marked area of large facets; front of female equal to width of eye. Face and cheeks yellowish with yellow hairs. Thorax slate blue with faintly marked admedian presutural stripes; pleuræ with long yellow hairs. Abdomen golden yellow with bronzy sheen. Sternopleural bristles arranged 1:1..... **C. stygia** Fabricius.
   Very similar but smaller. Male eyes distinctly separated and without any large faceted area..... **C. hilli** sp. nov.
   Large orange species. Eyes of male a little separated without a large faceted area; front of female not quite equal to width of eye. Face and cheeks yellowish with short dark hairs and longer silky ones. Abdomen orange with a broad median metallic blue stripe on tergites 1 to 3, widest on the latter; fourth tergite yellowish.
   C. augur Linnæus.

Genus **LUCILIA** Robineau–Desvoidy

In this genus are included those Calliphorinæ in which the eyes of the male are closely approximated (rather widely separated in a few), and those of the female are widely separated. The third antennal segment is about four times as long as the second, and the arista has hairs on both sides almost to the tip, so that the bare apical portion is short. The palps are usually yellowish, seldom dark. The epistome is somewhat prominent. There are always two well-developed decumbent parafrontal bristles as in *Calliphora*. The thoracic chætotaxy is similar to that of *Calliphora;* the number of the postsutural acrostical bristles varies in the species and they are a useful character for separating the species. The three sternopleural bristles are arranged 2 : 1. The venation is similar to that of *Calliphora,* vein M_{1+2} bends up with rather a sharp angle, and joins the costa well behind vein R_{4+5}. The radius is always bare, as in *Calliphora,* vein R_{4+5} has a row of bristles on its upper and lower surfaces, the former extending toward the radiomedial crossvein, the latter almost up to it. The squamæ are always bare.

Most of the species of this genus are metallic green or blue, though one Australian species to be described presently is yellowish. The species of this genus must not be confused with those of *Cryptolucilia* and *Pyrellia,* which belong to the Muscinæ and therefore have no hypopleural bristles.

The species that are of importance from the medical and veterinary standpoint are *Lucilia sericata* Meigen, *L. cuprina* Wiedemann, *L. nosocomiorum* Doleschall, and *L. fergusoni* sp. nov. The following notes and key to these species will be found useful:

Lucilia fergusoni sp. nov.

Male.—Eyes almost meeting in the middle line. Face, cheeks, antennæ, and palps golden yellow, the cheeks with golden hairs; arista dark. Mesonotum metallic blue with white pollen; two or three presutural dorsocentral and acrostical bristles and two postsutural acrostical bristles; pleuræ orange yellow; sternopleural bristles 2:1, in one male 3:1. Abdomen orange; first tergite orange with a very narrow dark posterior band; second tergite with a metallic blue triangular patch not reaching the anterior margin, and forming a narrow posterior band; third tergite with a larger blue patch almost covering the whole of the tergite. Femora and tibiæ orange; tarsi dark brown. Vein R_{4+5} with bristles on both sides, as noted above. Squamæ bare.

Female.—Front almost half the width of the eye; parafrontals yellow. In all other respects similar to the male.

Doctor Ferguson recently sent me one female and two males of this interesting species from Sydney, and I have much pleasure in naming it for him; it is the only species of this genus known to me which is of an orange color. It may be confused with *C. augur,* which it resembles superficially. It can, however, be distinguished at once by noting that in *augur* the squamæ are hairy, while they are bare in *fergusoni;* there are many other distinguishing characters, but this one is the most certain. The mesonotum of *augur* is not metallic blue but slate blue. It may be confused also with *Chrysomyia incisuralis;* the characters distinguishing the two will be noted under that species. It is quite possible that *L. fergusoni* may prove to be a sheep-maggot fly.

Lucilia sericata Meigen.

This species can be distinguished from its near ally *L. caesar* Linnæus by noting that in the former there are always three postsutural acrostical bristles, whereas in *L. caesar* there are only two. The front of the male *sericata* is about one-third the

width of the eye; the eyes of the male *caesar* are closely approximated. In both species the palps are yellowish.

Lucilia cuprina Wiedemann.

Lucilia argyricephala Macquart.
Lucilia serenissima Walker.

This species can be distinguished by noting that there are three post-sutural acrostical bristles; that the front of the male is about one-fourth the width of the eye; that the thorax and abdomen have well-marked white pollinosity; and that the latter is often of a bronzy sheen and much more light green than that of *sericata*. *Lucilia cuprina* is an Oriental and Ethiopian species.

Lucilia nosocomiorum Doleschall.

Lucilia marginifera Walker.
Musca rutescens Walker.
Lucilia inscribens Walker.
Lucilia nesiotis Schiner.
Lucilia nebulosa Bigot.
Lucilia pachymosa Bigot.
Lucilia japonica Bigot.
? Lucilia jeddensis Bigot.
Lucilia cyaneo-marginata Bigot.
Lucilia tasmaniensis Froggatt (nec Macquart).

A large species, common in the Australian Region, and probably a sheep-maggot fly in some of the localities where it is found; it is not unlike the Oriental *L. inducta* Walker. It can be distinguished from *L. sericata* by noting that the eyes of the male almost meet in the middle line and that there are only two post-sutural acrostical bristles; it may be confused with *L. caesar*, but it is a much bluer fly and the eyes of the male are closer together than are those of the male *caesar;* the female front is less than half the width of the eye, whereas in the female *caesar* it is exactly or a little more than half the width of the eye. *Lucilia nosocomiorum* is closely allied to *L. inducta* from the Oriental Region and it is possible that they are the same; more material of the Australian species is required before this can be settled. I trust Australian workers will send me its larvæ and a good series of adults.

The species discussed may be distinguished by the following key:

Key to the important species of the genus Lucilia.

1. Two post-sutural acrostical bristles ..... 2.
   Three post-sutural acrostical bristles ..... 4.
2. Entirely metallic species ..... 3.
   Orange species with metallic markings. Eyes in the male almost meeting in the middle line; front of female about half the width of the eye. Face, cheeks, antennæ, and palps yellow. Mesonotum metallic blue, pleuræ orange. Abdomen orange; first tergite orange with narrow posterior dark band; second tergite with blue triangular patch not reaching anterior border of segment, and forming a narrow posterior band; third tergite with large blue patch almost covering the whole tergite. Femora and tibiæ orange, tarsi dark. (Australian Region.) ..... **L. fergusoni** sp. nov.
3. Front of male very narrow, eyes a little separated; front of female about half the width of the eye. A bright metallic green species. (Australia, South Africa, Europe.) ..... **L. caesar** Linnæus.
   Front of male very narrow, the eyes almost meeting; front of female much less than half the width of the eye. A large metallic species. (Australian Region.) ..... **L. nosocomiorum** Doleschall.
4. Front of male about one-third the width of the eye; front of female about equal to the width of the eye. A green to dark green species with white pollen on thorax ..... **L. sericata** Meigen.
   Front of male about one-fourth the width of the eye; front of female about equal to or a little wider than the width of the eye. A smaller fly of a brighter metallic green with well-marked white pollen and bronzy sheen, especially on abdomen. Oriental and Ethiopian.
   L. cuprina Wiedemann.

Genus **CHRYSOMYIA** Robineau-Desvoidy

The species belonging to this genus are mostly medium-sized Calliphorinæ, but some of the Australian forms are small. Here again several attempts have been made to split the genus up into smaller groups, using such characters as the bristles, epistome, markings of the thorax, and the hairiness or otherwise of the squamæ. As the species are so imperfectly known at present, I consider it best to keep them in the single genus *Chrysomyia,* which may be defined as follows:

Eyes in life often of a characteristic brick color and in the males closely approximated (except in a few, *C. villeneuvei* Patton, *C. laxifrons* Villeneuve); in many of the males the upper and middle facets of the eyes are conspicuously enlarged and form a characteristic band; in the female the front is always wide and in some species conspicuously so; there are usually two small parafrontal bristles, one above the other, but they may be wanting. The front and cheeks are either

brownish yellow or silvery, the latter often buff yellow with silky yellow hairs. The epistome may or may not be prominent. The antennæ are either dark reddish yellow or bright orange; the arista has long hairs almost to the tip on both sides; in some species those on the lower surface are shorter. The palps are in the majority of the species yellow. The thorax is often conspicuously white in front of the suture, and is as a rule marked with narrow dark stripes (in one species, *macellaria,* there are three broad dark stripes); this character is not of any generic value. The thoracic chætotaxy is as follows: Humeral 3; posthumeral 1; presutural 1; notopleural 1; supra-alar 3; intra-alar 2; post-alar 2; dorsocentral 5 or 6 (2 in front of the suture and 3 or 4 behind it, the latter often variable in size and number); acrostical bristles 2, the presutural ones absent; often a small bristle between the basal dorsocentral and acrostical bristles; sternopleural bristles 2 or 3, arranged 1 : 1 or 2 : 1; mesopleural 5 or 6. The abdomen is often marked with dark blue bands at the bases of tergites 2 and 3. The venation is similar to that of *Calliphora* and *Lucilia;* vein R_{4+5} has a row of strong bristles on its dorsal surface extending toward the radiomedial crossvein, and there are a few small bristles at the base on the ventral side; the root of the radial sector nearly always has long hairs on its posterior border. The squamæ with few exceptions are covered with long hairs on the dorsal surface.

This genus contains the important myiasis-producing Calliphorinæ; *C. bezziana* and *C. macellaria* are the two best-known species. The following notes will be of use in identification of species.

The three most important Old World species of this genus are *Chrysomyia megacephala* Fabricius, *C. bezziana* Villeneuve, and a third species closely related to the other two. As already noted, *C. megacephala* is an Oriental and Australasian species, *C. bezziana* is found in the Ethiopian and Oriental Regions, and the third species is Australasian. The last-mentioned species was sent to me by Mr. Illingworth and Mr. Hill from different localities in Australia; though I recognized it was distinct from *megacephala* and *bezziana* I was unable to give it a name, and I could not find a single specimen in any of the collections I examined until I came to work through Bigot's collection where I found it described under the name *micropogon.* I have little

doubt that this species has been confused with *megacephala* in the Australasian Region.

For some time I have made a special effort to find out the eastern limit of the distribution of *C. bezziana,* a point of considerable importance, for this fly is one of man's most serious pests. Until recently I believed it did not extend beyond Java, but fresh evidence has now come to light which shows that it is widely distributed in the Philippine Islands.

In a recent paper on the foot maggot, *Booponus intonsus* Aldrich of the Philippine Islands, Woodworth and Ashcraft [2] draw attention to the larva of this fly, and point out how it can be distinguished from the common screw worm of the Philippines, which they record as *Compsomyia dux.* From their description of the larva of *dux,* which as I have shown is *Chrysomyia megacephala* Fabricius, and from the illustrations of its anterior and posterior extremities and the structure of the anterior spiracle, I have no doubt whatever that the larva they refer to as the common screw worm of the Philippine Islands is not that of *C. megacephala* but is the larva of *C. bezziana.* The anterior spiracle of the larva of *megacephala* always has ten or eleven openings and that of the larva of *bezziana* six; further, the plates of the posterior stigmata of the larva of *bezziana* are smaller than are those of the larva of *megacephala.* The anterior spiracles of the common screw worm of the Philippines according to Woodworth and Ashcraft has six openings, and the posterior stigmatic plates as illustrated are typical of the larva of *C. bezziana.* Short of examining a larva of this common Philippine myiasis-producing calliphorine I have no doubt that the common screw-worm fly of these Islands is *C. bezziana.* It would be interesting to know if *C. bezziana* in the Philippine Islands ever attacks man. In Africa, so far as is known at present, it only deposits its eggs in the tissues of animals, but in India it is a common human parasite. I will be very glad if medical or veterinary officers in the Philippine Islands will send me the larvæ of this fly and keep a lookout for it in human tissues.

As there is the possibility that *C. bezziana* may yet find its way into Australia, it is important that entomologists as well as medical and veterinary officers should be able to recognize it as well as its near allies *C. megacephala* and *C. micropogon.*

[2] Philip. Journ. Sci. 22 (1923) 143.

I imagine it would be an unfortunate event to the sheep-farming industry if *C. bezziana* established itself in Australia. The three species can be distinguished by noting the following points:

The male of *megacephala* has a well-marked band of large facets on the front of the eyes; the facets of the eyes of the males of *bezziana* and *micropogon* are all about the same size, so that it is always easy to separate the male of *megacephala* from the males of the other two species. It is not so easy to distinguish the male of *bezziana* from that of *micropogon,* but in the former the parafrontals and parafacials are silvery, whereas those of the latter are grayish yellow. The face and cheeks of the male *bezziana* are saffron color; those of the male of *micropogon* are much darker yellow. The third antennal segment of *bezziana* is lighter yellow than that of *micropogon.* The most reliable character is to be found in the squamæ; in *bezziana* they are waxy white, in *micropogon* they are of a dirty gray color.

The females of the three species are difficult to distinguish, and an expert opinion is necessary in most cases unless the observer has specimens of all three species before him for comparison. The following characters should be mainly relied on to separate them: The front of the female *bezziana* is almost exactly half the width of the eye; the frontal stripe is reddish brown with straight sides and is almost the same width throughout; the parafrontals and parafacials are silvery below, grayish yellow in the middle, and blackish at the vertex, and are nearly the width of the frontal stripe. The front of the female *micropogon* is distinctly more than half the width of the eye; the frontal stripe is distinctly wider than that of *bezziana* and is also reddish brown, and always a little narrower at its ends, the middle portion being distinctly wider; the parafrontals and parafacials are yellowish gray throughout but darker at the vertex, and about as broad as the frontal stripe. The front in the female *megacephala* is much more than half the width of the eye; the frontal stripe is dark brown, often blackish, is about one-third the width of the eye, and has bulging sides, being narrower at the two ends; the parafrontals and parafacials are dark grayish; the vertex is dark metallic green. The squamæ of *bezziana* are waxy white, whereas those of *megacephala* and *micropogon* are dirty gray.

The other important species of this genus in Australia is *C. albiceps* var. *putoria,* commonly known as *C. rufifacies* Macquart.

When referring to this species Macquart calls it *Lucilia rufifacies* Guerin-Meneville, but there is no such species described by Guerin-Meneville. It seems most likely that Macquart confused the name of Guerin-Meneville's species *Lucilia chrysocephala,* and changed it to *rufifacies.* This species, *chrysocephala,* was described by Guerin-Meneville in 1820, but the plates accompanying his paper are labeled 1832. It is not possible to be certain of this species, from either Guerin-Meneville's description or the colored illustration, and unfortunately the type no longer exists. The illustration shows a calliphorine with green thorax, blue abdomen, and red cheeks; from the description it may quite well be a species of *Lucilia,* for Guerin-Meneville says it has strong recurved hairs, meaning bristles. Professor Bezzi, with whom I discussed this point, agrees with me that *chrysocephala* is a species of *Lucilia,* either *L. caesar* or *L. sericata,* two common Australian species. I could not find a specimen of *rufifacies* in Macquart's collection. It is, I think, best under these circumstances to drop both *chrysocephala* and *rufifacies.*

Chrysomyia albiceps var. *putoria* Wiedemann is the most important sheep-maggot fly of Australia. Its larva is the well-known hairy maggot. There is, however, a closely allied species, the larvæ of which Mr. Illingworth and Mr. Hill have sent me. The larva is very like, if not identical with, the larva of *C. villeneuvei* Patton. It can be distinguished from that of *putoria* by the strong spines on the fleshy processes; the processes of the larva of *putoria* are almost smooth. I hope Australian entomologists will succeed in hatching out this fly when they come across its larvæ.

Another species with a very similar hairy maggot is *C. incisuralis* Macquart (*Ochromyia incisuralis* Macquart), which Surcouf curiously enough places in a new genus, *Psilostoma;* it is a typical species of this genus. I have received a number of specimens from Mr. Illingworth and from Doctor Ferguson; those from the latter show that the northern Australian form is much more orange than are those from the south; it is not known if this species is a sheep-maggot fly.

There are three small species of this genus which Townsend has placed in the genus *Microcalliphora;* I consider they belong to the genus *Chrysomyia.* Two of the species are new and are described below, the third is the well-known *Chrysomyia varipes* Macquart.

Chrysomyia varipes Macquart.

Front of female nearly equal to the width of the eye; frontal stripe broad and dark brown; parafrontals rather dark slate blue; face and cheeks yellowish white. Antennæ and palps orange. Thorax and abdomen dark green; the first abdominal tergite dark blue; the second and third green with broad, dark blue, basal bands. Legs mainly dark brown; fore femora yellow at the apex and along the inner margin; tibiæ dark brown, the apex yellow; tarsi brown; midfemora brown with yellow base and apex, tibiæ and first tarsus yellow, remaining tarsi brown; hind femora with basal third yellow, tibiæ and tarsi similar to those of midlegs. The male is unknown to me.

Chrysomyia fulvipes sp. nov.

Female.—Front considerably less than width of eye; lower half of parafrontals, all parafacials, face, and cheeks yellow; lower half of frontal stripe bright orange, upper half of stripe and parafrontals dark metallic green. Antennæ and palps orange. Thorax bronze green, presutural area shimmering white. Abdomen bright green; first tergite dark blue; second tergite with a broad dark blue basal band; third tergite with a narrower band. All femora, tibiæ, and most of first tarsi orange, remaining tarsi dark. I have not seen the male of this small bronzy green species. The females were collected at Cairns, northern Queensland, and were sent to me by Mr. Illingworth.

Chrysomyia annulipes sp. nov.

Female.—Front a little more than half width of eye; parafrontals and frontal stripe blackish except the lower part of the former which is orange; face and cheeks whitish yellow. Antennæ and palps orange. Thorax bright green; mesothoracic stigmata white; pleura below stigmata with white shimmering pollinosity. Abdomen dark green; first tergite dark blue; second with a broad dark blue basal band, the band on the third tergite narrower. Inner surfaces of fore femora orange, outer dark brown, dorsal surface with a fringe of long, brushlike, yellowish white hairs; fore tibiæ and tarsi dark brown; midfemora with base and apex orange, remainder dark brown; middle tibiæ and first tarsus orange, remainder dark brown; hind femora with apical half dark brown, tibiæ dark orange,

and tarsi dark brown. The type was sent to me by Mr. Illingworth from Cairns, northern Queensland.

The larva of *C. varipes* has fleshy processes like that of *C. albiceps* var. *putoria* and is said to be found commonly in soiled wool. The larva of *C. fulvipes* is smooth. I have not seen the larva of *C. annulipes*. I will be glad to receive any further material, especially the early stages, of these three small species.

In concluding these notes, I should like to express my great indebtedness to Mr. Hill, Mr. Illingworth, Doctor Ferguson, and Mr. W. W. Froggatt for the valuable collections they have sent me from Australia; I could never have accomplished as much as I have in clearing up the synonymy of the Australian species had I not had this extensive material for study.

THIRD REPORT UPON DIPTERA PUPIPARA FROM THE PHILIPPINE ISLANDS

By G. F. Ferris

Of Stanford University, California

FIVE TEXT FIGURES

This paper is the third of a series dealing with the Diptera Pupipara of the Philippine Islands. For the material upon which it is based I am indebted, in part to Mr. E. H. Taylor, and in part to Mr. R. C. McGregor. Representatives of one species were originally collected by Mr. McGregor but were received by me through the kindness of Dr. M. Bezzi. Specimens of all the species are deposited in the collections of the Philippine Bureau of Science.

NYCTERIBIIDÆ

Genus **CYCLOPODIA** Kolenati

Cyclopodia horsfieldi de Meijere. Fig. 1.

Cyclopodia horsfieldi de Meijere, Tijdschr. v. Entom. 42 (1899) 153.
Cyclopodia horsfieldi de Meijere, Speiser, Archiv für Naturgesch. 67[1] (1901) 51, 64.
Cyclopodia horsfieldi de Meijere, Scott, Parasitology 9 (1917) 607.

Previous records.—From unknown hosts in Java and Sumatra; *Pteropus vampyrus,* Malay Peninsula; *Pteropus philippinensis,* La Carlota, Occidental Negros, Philippine Islands.[1]

Specimens examined.—Philippine specimens from *Pteropus speciosus,* Malanipa, Zamboanga (*Taylor*), *Pteropus vampyrus lunensis* and *Pteropus* sp., Palawan (from alcoholic bats in the United States National Museum); from unnamed *Pteropus,* Bangui, Luzon (*McGregor,* specimens received by me from Dr. M. Bezzi). Also specimens from *Pteropus hypomelanus enganus,* Engano, Sumatra, and *Pteropus alecto,* Gorontola, Gulf of Celebes (all from alcoholic bats in the United States National Museum).

Notes.—This is one of the large species of *Cyclopodia;* female, 5.5 millimeters; male, 5. According to Speiser[2] it can be dis-

[1] Scott, H., Parasitology 9 (1917) 607.
[2] Archiv für Naturgesch. 67[1] (1901) 51.

FIG. 1. *Cyclopodia horsfieldi* de Meijere; *a*, female, legs removed; *b*, anterior leg; *c*, halter; *d*, abdomen of male. All figures to the same scale.

tinguished in the female by the arrangement of the large setæ on the abdomen. In this species the long preapical setæ are very numerous and extend cephalad toward the short dorsal tubercles, thus forming a triangular area, whereas in the closely related *C. sykesi* they form a single row across the body and in

C. albertisi they are confined to a cluster at each side of the body. There is some variation in the specimens at hand; in some specimens the area of setæ reaches to the dorsal tubercles, in others it does not. In a female from Bangui there are probably not more than half as many of these large setæ as in the other specimens, although there seem to be no other differences, as the setæ are arranged in the same manner. I do not believe that more than one species is present in this material.

The male very closely resembles the males of other closely related species. The presence of small setæ over the dorsal surface of the head may possibly separate it from some other forms.

Scott [3] refers to a supposed difference in the halteres of some of the species of *Cyclopodia*. According to him—

> * * * in a number of the large species [that is, *C. sykesi, C. oxycephala*] they are large, flattened and scale-like, and minutely pollinose, but in *C. ferrarii* and *C. greefi* they are very small, with slender pedicel and knobbed apex.

Cyclopodia horsfieldi is undoutedly very close to *C. sykesi*, but the halteres are small and knobbed (fig. 1, *c*). However, they are concealed deeply in a pit between folds of the derm, these folds being thickly beset with minute points. It is probably these folds that Scott misinterpreted as the halteres, for the latter are very difficult to find. In *C. ferrarii* the halteres are exposed.

HIPPOBOSCIDÆ

Genus **LYNCHIA** Weyenbergh

The following assemblage of characters is usually considered as defining this genus: Wings present, functional, noncaducous, with several veins behind the costa and with but one "cross vein," r-m, present, consequently without a basal cell; ocelli absent; claws 3-toothed, scutellum with square posterior-lateral angles. In addition to this, I would call attention to the presence of a fringe of fingerlike processes at the posterior-lateral angles of the scutellum (fig. 3, *d*), a structure that has been utilized by Lutz, Neiva, and Costa Lima for the separation of this genus from their *Microlynchia*, and the area of transverse striations on the dorsum of the abdomen.

[3] Parasitology 9 (1917) 607.

Lynchia maura (Bigot). Figs. 2 and 3.

Lynchia maura (Bigot), MASSONAT, Annales de L'Université de Lyon N. S. (1), 28 (1909) 296–303, pl. 1, figs. 6–10.

Previous records.—Apparently this species has been taken only from pigeons. According to Massonat,[4] experiments in

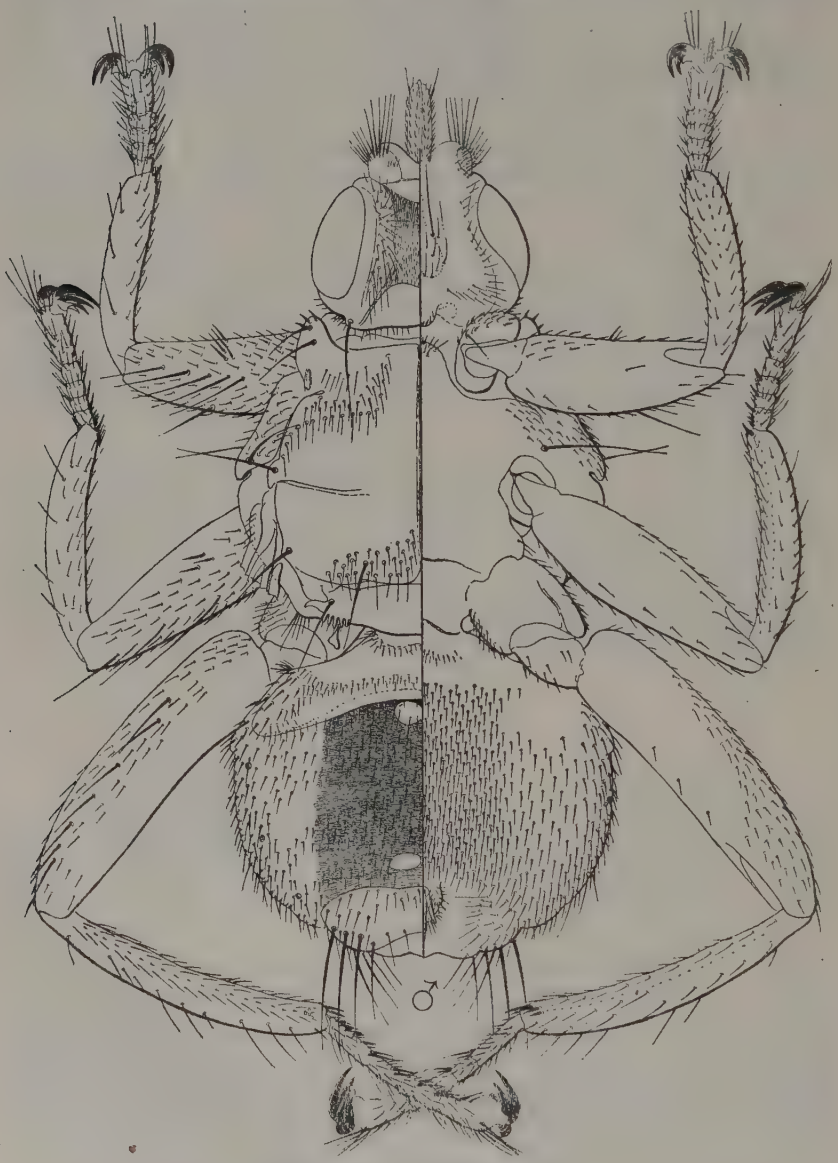


FIG. 2. *Lynchia maura* (Bigot); male, wings removed; from a Philippine specimen.

[4] Annales de L'Université de Lyon N. S. (1), 28 (1909) 296–303.

which an attempt was made to induce a transfer to other birds failed and the species seems to be confined to the one host. So far as I am aware, it has been recorded only from Europe and northern Africa.

Specimens examined.—A single female, without indication of host, received through the kindness of Doctor Bezzi and presumably coming from Italy; and a single male taken in flight in Manila, March 20, 1924, received from Mr. McGregor.

Notes.—Although the two specimens at hand are of different sex they agree so very closely that I am convinced they repre-

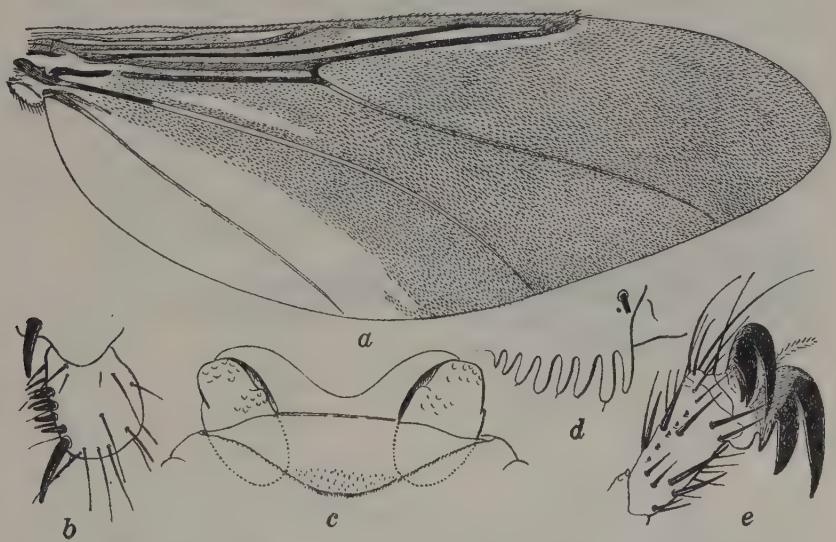


FIG. 3. *Lynchia maura* (Bigot); *a*, wing, to the same scale as fig. 2; *b*, first segment of middle tarsus; *c*, clypeal region of head; *d*, fringe at posterior lateral angle of scutellum; *e*, last segment of posterior tarsus.

sent but a single species. The only point of difference that I have been able to find and that may possibly have some significance is in the character of the setæ on the plantar surface of the first tarsal segment on the second legs. In the Philippine specimen this area bears a number of short, stout, black setæ (fig. 3, *b*), while in the European specimen there are here only small, slender setæ. In all other respects there is complete agreement as far as the difference in sex will permit. It should be noted that there is but little sexual dimorphism in this genus.

As the species is described and quite well known, I shall content myself with these notes and the accompanying figures.

Genus **ORNITHEZA** Speiser

The distinctive characters of this genus are given as follows: Wings present, functional, noncaducous, with several veins behind the costa and with three "cross veins," an anal cell consequently present, the "third vein" (R_{4+5}) not confluent with the costa, the "second vein" (R_{2+3}) becoming confluent with the costa but slightly beyond the tip of the "first vein" (R_1). Ocelli present. Claws 3-toothed. In addition I would note the

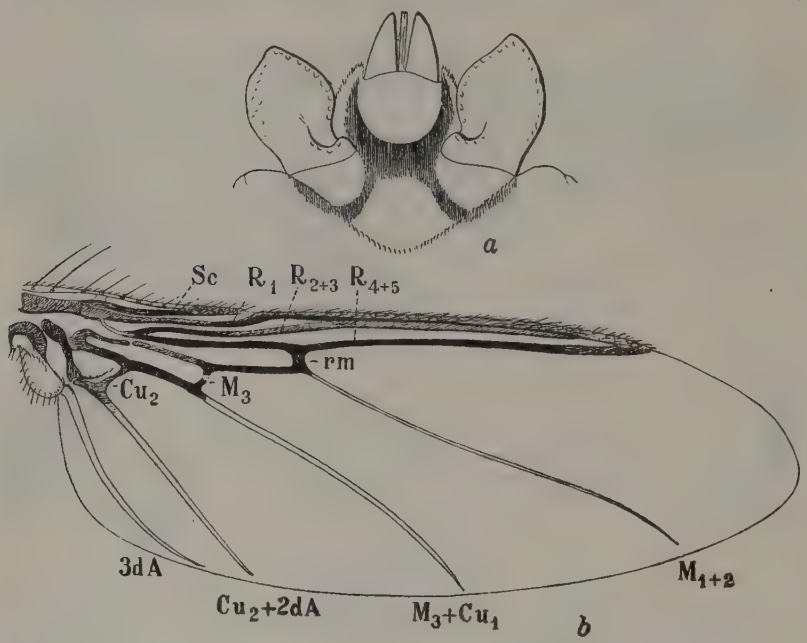


FIG. 4. *Ornitheza metallica* (Schiner); *a*, clypeal region of head; *b*, wing, to the same scale as fig. 5, venation according to Comstock-Needham system.

absence of a median, transversely striate area on the dorsum of the abdomen and of a transverse comb of setæ on the basal segment of the posterior tarsi. The presence of the last character is distinctive of the closely similar genus *Ornithoctona*. The antennæ are broad and flat, somewhat divergent, and scarcely exceeded by the palpi.

Several species have been described in the genus, but the descriptions are for the most part very inadequate, being concerned chiefly with color. However, the species at hand may apparently be referred to a described form.

Ornitheza metallica (Schiner). Figs. 4 and 5.

Ornitheza metallica (Schiner), MASSONAT, Annales de L'Université de Lyon N. S. (1), 28 (1909) 290–295, pl. 1, figs. 11–12.

Previous records.—A European species, recorded from *Garrulus glandarius* and *Ardea cinerea.*

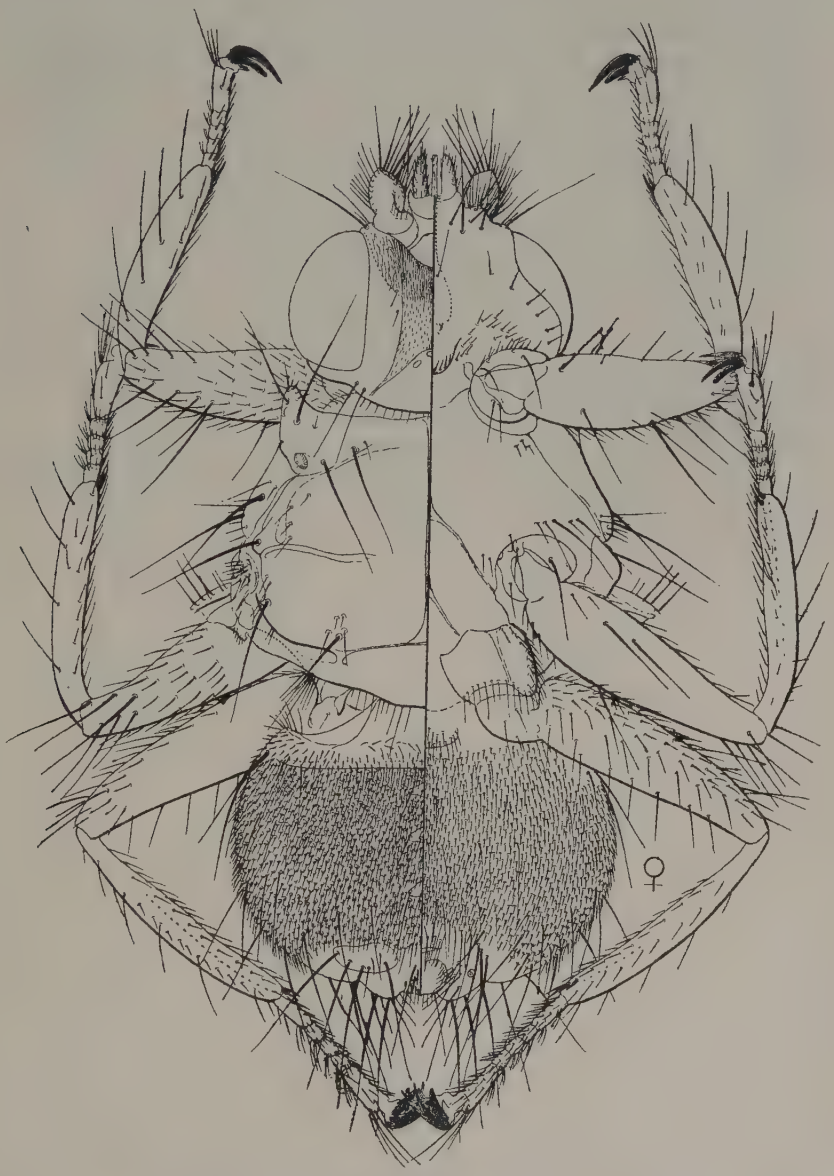


FIG. 5. *Ornitheza metallica* (Schiner); female, wings removed.

Material examined.—A single female from *Emberiza sulfurata*, Solsona, Luzon, December 16, 1923 (*McGregor*).

Notes.—The specimen at hand agrees very closely with the quite detailed description given by Massonat of *O. metallica* except for one slight difference: Massonat speaks of the presence of but two small, median plates on the dorsum of the abdomen, while in the specimen at hand there are three. It is entirely possible, however, that one of these might have been concealed beneath the basal plate, as frequently happens in contracted specimens; and, in view of the close resemblance in other respects, I am not inclined to separate the Philippine specimen.

Massonat has called attention to the peculiar character of the wings, there being an extra anal vein (fig. 4, *b*) which, according to the Comstock system, should be the third anal. This vein is apparently peculiar to this species. I would add the note that the wings are entirely destitute of minute setulæ and setæ are present only on the costa, those near the base being rather long. The claws are as in *Lynchia maura* and fig. 3, *e* will apply equally well to *O. metallica*.

The accompanying figures should make the recognition of the species possible, and I content myself with them and these notes.

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. *Cyclopodia horsfieldi* de Meijere; *a*, female, legs removed; *b*, anterior leg; *c*, halter; *d*, abdomen of male. All figures to the same scale.

2. *Lynchia maura* (Bigot); male, wings removed; from a Philippine specimen.

3. *Lynchia maura* (Bigot); *a*, wing, to the same scale as fig. 2; *b*, first segment of middle tarsus; *c*, clypeal region of head; *d*, fringe at posterior lateral angle of scutellum; *e*, last segment of posterior tarsus.

4. *Ornitheza metallica* (Schiner); *a*, clypeal region of head; *b*, wing, to the same scale as fig. 5, venation according to Comstock-Needham system.

5. *Ornitheza metallica* (Schiner); female, wings removed.

DIE TENEBRIONIDEN (COLEOPTERA) DES INDO-MALAYISCHEN GEBIETES, UNTER BERUECKSICHTIGUNG DER BENACHBARTEN FAUNEN, VI

DIE GATTUNGEN ISCHNODACTYLUS, HOPLOCEPHALA, UND MARTIANUS

Von Hans Gebien

Hamburg, Deutschland

ZWEI TAFELN

Genus **ISCHNODACTYLUS** Chevrolat

Ischnodactylus Chevrolat, Pet. Nouv. Ent. 2 (1877) 173.

Chevrolat, der Autor zahlreicher Diaperiden, hat auf diesem Gebiet leider viel gesündigt. Fast alle seine Beschreibungen sind unzureichend, enthalten nicht selten grobe Fehler, so dass er selbst genötigt war fortwährend Korrekturen zu geben. Auch bei unserer Gattung ist er unzuverlässig. In der Gattungsbeschreibung nennt er die Fühler 12-gliedrig, eine Art (*Ischnodactylus batesi*) soll 10-gliedrige Fühler haben. Sie sind aber weder 10- noch 12-gliedrig, sondern haben, wie alle Diaperiden, 11 Glieder.

Die Arten bieten in der Bewaffnung des Kopfes beim Männchen gute Merkmale. Einige Arten haben keine Hörner, meist dagegen sind zwei sehr lange, dünne, haarförmige, im Nacken entspringende Hörner vorhanden, die eng aneinander liegen. Solche Hornbildung kommt meines Wissens bei keinem Käfer wieder vor. Die Hörner sind entweder kahl, oder an der Spitze mit feinem Haarpinsel versehen, am Grunde dünn oder mit plötzlicher Verbreiterung. Die Zeichnung der Decken scheint sehr konstant zu sein wie bei den meisten Diaperiden. Die Decken sind entweder ungefleckt (*loripes, immaculatus*) oder mit zwei (*colon, rubromarginatus*), oder vier (*quadrioculatus, batesi, gradatus, mirabilis*) oder sechs Flecken versehen (*sexguttatus, bisetiger*), oder haben endlich vorn eine Querbinde (*sumbawicus, formosanus, unifasciatus, bisbifasciatus*). Chevrolat gibt als Gattungsmerkmal den stark aufgebogenen Clypeus an; leider trifft es nicht für alle Arten zu. *Ischnodactylus mirabilis*

und *I. batesi* haben ein dreieckig vorgezogenes Epistom, eine neue Art dort ein winziges Hörnchen, andere Arten einen gerade abgeschnittenen Vorderkopf dessen Wangen blattdünn sind. Wichtig für alle Arten ist die Bildung des hohen, sehr spitzen, seitlich scharf kompressen Prosternums. Der Körper ist im Gegensatz zu *Platydema* immer auffallend flach. Abweichend von dem oft ähnlichen *Basanus* haben die Flügeldecken vollständige, am Ende nicht ausgeschnittene Epipleuren.

Da die Färbung sehr beständig ist, lässt sich eine Bestimmungstabelle in erster Linie auf das leicht nachzuprüfende Merkmal der Zeichnung aufbauen. Die wesentlichen Artmerkmale liegen allerdings in der Kopfbildung der Männchen.

Bestimmungstabelle für die Arten der Gattung Ischnodactylus.[1]

1. Flügeldecken ungefleckt ..... 2.
   Flügeldecken mit hellen Binden oder Flecken ..... 3.
2. Körper oval, Hinterschienen des Männchens gerade, Kopf in diesem Geschlecht mit haarfeinen, parallelen Hörnern. (Sumatra und Borneo.) ..... **I. immaculatus sp. nov.**
   Körper parallelseitig, Hinterschienen beim Männchen gekrümmt, Kopf ungehörnt (ex Lewis). (Japan.) ..... **I. loripes Lewis.**
3. Flügeldecken wenigstens vorn mit Querbinde ..... 4.
   Flügeldecken mit runden oder eckigen Flecken, nie mit Binden ..... 8.
4. Die Decken nur mit einer Binde hinter der Basis, ein Spitzenfleck fehlt ..... 5.
   Decken auch hinten mit Binde oder Fleck ..... 6.
5. Die helle Binde ist viel schmäler als der schwarze Raum vor ihr, die mittleren Fühlerglieder sind kaum länger als breit, Stirnhörner des Männchens, von der Seite gesehen, S-förmig, zuerst der Stirn anliegend, unter den Hörnern auf der Stirn ist kein Längsfältchen. (Formosa.) ..... **I. formosanus sp. nov.**
   Die helle Binde ist so breit wie der Raum vor ihr, die mittleren Fühlerglieder des Männchens sind fast doppelt so lang wie dick, Stirnhorn gerade nach vorn gerichtet, unter ihm zarte Längsfältchen. (Assam.) ..... **I. unifasciatus sp. nov.**
6. Die vordere Binde erreicht den Rand und ist stark gezackt, die hintere geht vom Rand schräg nach vorn und innen; 8 bis 10 Millimeter gross. Zwischenräume ganz flach, auch aussen; Männchen ungehörnt. (Malacca und Sumatra.) ..... **I. pictipennis sp. nov.**
   Die vordere Binde erreicht selten den Rand und ist dann sehr breit, die hintere ist fleckenförmig, quer, nicht nach vorn gezogen und lässt den Rand ganz frei; Männchen gehörnt (auch bei *I. sumbawicus* ?) ..... 7.
7. Zwischenräume vollkommen flach, vorderer Fleck viel breiter als der Rand vor ihm, auf acht Zwischenräumen vorhanden, Vorderkopf des Weibchens halbkreisförmig, hinterer Fleck quadratisch. (Sumbawa.) ..... **I. sumbawicus sp. nov.**

[1] *Ischnodactylus tetradymus* Fairmaire von Zanzibar ist ein *Peltoides*.

Zwischenräume an der Seite und alle an der Spitze stark gewölbt, vorderer Fleck schmäler, fünf Zwischenräume einnehmend, hinterer bindenartig, schräg. Vorderkopf beim Weibchen mit gerade abgestutztem Epistom. (Formosa.) ..... **I. bisbifasciatus** sp. nov.

8. Jede Decke nur mit einem Fleck im ersten Drittel ..... 9.
Die Flügeldecken auch hinten gefleckt ..... 11.

9. Kopf mit scharfen und schmalen Augenfurchen, der Fleck viel grösser als der dunkle Raum an der Basis vor ihm. Flügeldecken flach, an den Seiten tief gefurcht, die Seiten nahezu parallel. (Philippinen.) ..... **I. bimaculatus** sp. nov.
Kopf ohne Augenfurchen, Flecken kleiner als der dunkle Raum vor ihm an der Basis oder ebenso gross; Flügeldecken von den Schultern an nach hinten etwas erweitert und im ersten Drittel sehr stumpf gewinkelt ..... 10.

10. Körper auffallend flach, Decken an den Seiten tief gefurcht, der verflachte Rand hinten verbreitert, nicht hell. Fleck klein, Hörner des Männchens sehr lang, ausserordentlich stark gekrümmt, am Grunde scharf und plötzlich erweitert, circa 7 Millimeter gross. (Borneo und Sumatra.) ..... **I. colon** sp. nov.
Körper gewölbter, Decken aussen nicht gefurcht, der verflachte Seitenrand hinten nicht verbreitert, hell gefärbt, Flecken gross, Hörner des Männchens kurz, gerade, mit ebenso langen, äusserst zarten Haarbüscheln an der Spitze, welche die Hörner fortsetzen, am Grunde nicht verbreitert, circa 5 Millimeter lang. (Malacca und Sumatra.) ..... I. rubromarginatus Chevrolat.

11. Jede Decke mit zwei Flecken ..... 12.
Jede Decke mit drei Flecken (der dritte, sehr kleine Fleck liegt entweder an der Schulter oder hart neben dem vorderen) ..... 19.

12. Vorderkopf lang, seine Ränder aufgebogen, Epistom beim Männchen vorgezogen, meist dreieckig. Körper sehr flach, Halsschildseiten ganz verflacht ..... 13.
Vorderkopf kurz, seine Ränder nicht aufgebogen, Epistom gerade abgestutzt, Hörner des Männchens am Grunde verbreitert, Körper gewölbter, besonders an den Seiten des Halsschildes. (Sumatra.) **I. gradatus** sp. nov.

13. Flügeldecken an den Seiten gefurcht, Männchen meist mit zwei sehr langen, dünnen, am Grunde dem Kopf anliegenden Hörnern ..... 14.
Flügeldecken an den Seiten nicht gefurcht, Männchen ungehörnt .. 17.

14. Kopf des Männchens ungehörnt; Flecken der Flügeldecken dunkel blutrot, Epistom des Männchens gerade abgestutzt mit kleiner, dreieckiger Spitze. (Philippinen.) ..... **I. bakeri** sp. nov.
Kopf des Männchens gehörnt, Flecken der Flügeldecken gelblichrot, Epistom des Männchens mit Horn oder einfach stark dreieckig vorgezogen ..... 15.

15. Der vordere Fleck nimmt ungefähr fünf Zwischenräume ein, Epistom des Männchens in der Mitte mit spitzem, wagerechten Horn, ausserdem finden sich im Nacken zwei Hörner. (Philippinen.) .. **I. nasutus** sp. nov.
Der vordere Fleck hat nur die Breite von zwei bis drei Zwischenräumen, Epistom des Männchens höchstens dreieckig vorgezogen ..... 16.

16. Vorderer Fleck quer, viel schmäler als der Raum vor ihm, die äusseren Reihen tief gefurcht, Fühlerglieder beim Männchen quer, Körper glänzend schwarz. (Insel Simalur.) ..... I. **mirabilis** Gebien.
Vorderer Fleck rund, so breit wie die dunkle Basis vor ihm, die äusseren Streifen schwach gefurcht, die mittleren Fühlerglieder beim Männchen so breit wie lang, Körper hellbraun. (Borneo.)
I. **trigonalis** sp. nov.
17. Die Flecken der Flügeldecken von ausserordentlicher Grösse, der vordere lässt nur den Nahtstreif und den äussersten frei, der Spitzenfleck nimmt die ganze Spitze ein. Halsschild querüber bis zum Seitenrand gewölbt, Vorderkopf stark verkürzt. (Philippinen.)
I. **fenestratus** sp. nov.
Die Flecken viel kleiner, der vordere höchstens so breit wie vier bis fünf Zwischenräume, der hintere rings vom schwarzen Grunde umgeben. Halsschild an den Seiten ganz flach gedrückt ..... 18.
18. Flecken sehr gross, der vordere nimmt mindestens die Breite von vier Zwischenräumen ein, Fühlerglieder so breit wie lang, das Epistom des Männchens ist stark aufgebogen, aber nicht dreieckig vorgezogen, die Stirn in diesem Geschlecht mit zwei Längsfältchen. (Java.) ..... I. **quadrioculatus** Chevrolat.
Flecken viel kleiner, der vordere höchstens von der Breite dreier Zwischenräume. Fühlerglieder deutlich quer, das Epistom des Männchens ist dreieckig vorgezogen, Stirn nur einfach gefurcht. (Sumatra.) ..... I. **batesi** Chevrolat.
19. Der vordere Fleck ist doppelt. Männchen mit zwei Tuberkeln im Nacken und aufgesetzter Spitze am Clypeus. (Sumatra.)
I. **sexguttatus** sp. nov.
Der vordere Fleck ist einfach, der dritte liegt an der Schulter. Männchen mit haarförmigen, langen Hörnern im Nacken und gerade abgesetztem Clypeus. (Sumatra.) ..... I. **bisetiger** sp. nov.

Ischnodactylus immaculatus sp. nov.

Flach, ziemlich lang oval. Oberseite schwarz, oder schwarzbraun, ungefleckt, Rand der Decken, Fühler, Beine, und Unterseite hellbraun.

Der Kopf ist stark quer und hat stark vorquellende Augen, die innen fast eckig gegeneinander stossen, der Abstand ist ein Viertel so breit wie ein Auge und beim Männchen breit vertieft, also nicht gefurcht, beim Weibchen flach, kräftig punktiert. Die Wangen sind geradlinig schnell verengt, das Epistom ist gerade abgestutzt, vor den Augen findet sich eine kräftige Vertiefung, aber weder der Seitenrand noch das Epistom sind aufgebogen. Eine Clypealnaht fehlt, der Clypeus ist fein punktiert. Die Hornbildung des Männchens ist ähnlich wie bei *colon*, die Hörner sind dünn, riemenförmig, hinten nicht ganz senkrecht auf den Kopf gesetzt, sondern mit deutlicher Neigung nach vorn, dementsprechend ist die Biegung keine ganz halbkreisförmige,

am Grunde findet sich keine Verbreiterung, sondern die Hörner sind parallel, am Ende findet sich ein feiner, langer Pinsel. Die Fühler sind gelbrot, Glied 3 ist so lang wie 4, dieses ist länger, aber nicht viel schmäler als die folgenden Glieder, die rundlich sind und fast so breit wie lang. Das Kinn des Männchens hat eine rundliche, am Grunde flache Grube mit feinen Haarbüschel.

Der Halsschild ist dreimal so breit wie in der Mittellinie lang, der basale Mittellappen ist klein, wenig weit nach hinten gezogen. Von oben gesehen ist der Vorderrand sehr schwach ausgeschnitten, sehr fein, aber vollständig gerandet, es sind nur die beiden basalen Grübchen vorhanden, Seitengruben sind höchstens schwach angedeutet. Die Punktierung ist oberflächlich und sehr fein.

Die Flügeldecken sind ungefleckt, nur ist zuweilen die Naht hinten heller. Die Zwischenräume sind gleichbreit, die inneren ganz flach, die äusseren und alle an der Spitze stark gewölbt wie bei den meisten andern Arten.

Das Prosternum, die Mitte der Hinterbrust ganz hinten, das erste Abdominalsegment sind beim Männchen sehr fein, goldgelb, undeutlich behaart. Die Punktierung der Zwischenräume ist nur bei starker Vergrösserung erkennbar. An den Hintertarsen ist Glied 1 viel kürzer als der Rest.

Länge, 5.2 bis 6.9 Millimeter; Breite, 3 bis 3.4.

Vierundzwanzig Exemplare in den Sammlungen Stettin, München, und Gebien.

Sumatra, Soekaranda (*Dohrn*); Liangagas (*Dohrn*). Borneo, Sarawak, Ophir (*Wallace*).

Diese Art ist von allen andern Arten der Sunda Inseln durch die ungefleckten Flügeldecken zu unterscheiden. Dasselbe Merkmal zeigt auch *I. loripes* Lewis aus Japan, eine Art die ich nicht kenne, und die möglicherweise garnicht zur Gattung gehört, denn der Körper ist parallelseitig, das Männchen ist ungehörnt und hat gekrümmte Hinterschienen, ein Kennzeichen das bei keiner andern Art vorkommt, überdies sind die ganzen Decken punktiert gestreift. In der Hornbildung kommt unsere Art dem *I. colon* am nächsten, aber es fehlt die seitliche Verbreiterung der Hörner im ersten Viertel. Ganz gleich ist aber die Hornbildung bei *I. mirabilis* (denn die Kreuzung der Hörner bei *mirabilis* ist vielleicht individuell), nur dass bei dieser Art die Hörner zuerst dem Kopf anliegen, sich dann erheben, ohne sich stark bogig nach unten zu senken, auch fehlt das Haarbüschel am Ende, überdies ist *mirabilis* auf den Decken gefleckt.

Ischnodactylus loripes Lewis.

Ischnodactylus loripes Lewis, Ann. & Mag. Nat. Hist. VI 13 (1894) 392, pl. 13, fig. 6, Männchen.

Diese Art ist mir unbekannt geblieben. Ich kann also auch nicht sicher angeben ob sie wirklich zur Gattung gehört. Die ganz abweichende, parallele, an die *Diaclina*-Arten erinnernde Gestalt, der einfache, ungehörnte, nicht vorgezogene Kopf, und die Form der Hinterbeine des Männchens sind ganz abweichende Charaktere.

Japan, Oyayama.

Ischnodactylus colon sp. nov. Tafel 1, Fig. 1 und 2.

Oval, sehr flach, glänzend schwarz, Unterseite und Beine schwarzbraun, die beiden ersten Fühlerglieder, die Hörner, und die Flecken der Decken gelbrot.

Der Kopf ist stark quer, die Augen quellen stark vor, ihr Innenrand ist breit verrundet, die Stirn zwischen ihnen nur ungefähr ein Viertel so breit wie ein Auge von oben gesehen, beim Männchen der Länge nach tief eingedrückt und fast glatt, beim Weibchen deutlich, wenn auch flach punktiert. Die Clypealnaht ist dicht ans Auge gerückt, gut ausgeprägt, der Vorderkopf ist kurz, aber viel länger als die Stirn zwischen den Augen. Die Wangen verengen sich schnell und geradlinig, sie sind vor den Augen tief eingedrückt, aber ihr Rand ist nicht aufgebogen, das Epistom ist schwach gewölbt, gerade abgeschnitten. Beim Männchen entspringen im Nacken zwei sehr dünne, ausserordentlich lange Hörner, die dem Hinterkopf am Grunde senkrecht aufgesetzt sind, von der Seite gesehen einen Halbkreis oder mehr bilden und mit dem Ende sich dem Epistom nähern oder es berühren. Dieses Ende trägt, so fein es auch ist, ein längeres Büschelchen gelber Haare. Die Hörner sind riemenförmig, der Grundteil ist scharfeckig verbreitert abgesetzt, aber ebenfalls parallelseitig. Die Fühler sind bis auf das erste oder die beiden ersten Glieder schwarz, Glied 3 gleich 4, doch ist dieses etwas breiter, die folgenden sind verrundet, ungefähr so breit wie lang, Glied 11 ist ziemlich lang oval. Das Mentum hat beim Männchen eine schwach quere, vorn scharf begrenzte, am Grunde flache Grube, die ein Haarbüschel trägt.

Das Pronotum ist fast dreimal so breit wie lang, es hat nur die beiden basalen Grübchen, die Seiten sind flach, in der Endhälfte parallel, dann nach vorn in kräftigem Bogen verengt, die Vorderecken sind breit verrundet, die Randung ist dort sehr

fein, aber vollständig. Die Punktierung ist sehr fein und oberflächlich, ziemlich dicht.

Die Flügeldecken haben einen sehr schwach durchscheinenden Rand, sie sind hinter der Schulter leicht gerundet erweitert, dann wieder verengt, der Seitenrand ist verflacht abgesetzt und nach hinten deutlich verbreitert. Es sind Reihen äusserst fein eingestochener, dichtstehender Punkte vorhanden, die inneren Zwischenräume sind ganz flach, die äusseren stark gewölbt, unpunktiert. Es ist auf jeder Decke nur ein gelber Fleck vorhanden, welcher ziemlich kreisrund ist, von dem Durchmesser wie der Raum vor dem Fleck bis zur Basis, er nimmt den vierten und fünften Zwischenraum ganz ein, greift aber auch leicht auf den dritten und sechsten über; die Zwischenräume sind dort nicht verbreitert.

Das Prosternum ist beim Männchen sehr fein und dicht punktiert und gelb, unauffällig behaart, auch das erste Abdominalsegment zeigt leichte Behaarung und auf dem Metasternum findet sich hinten jederseits der Mitte ein Porenpunkt mit je einem sehr feinen, anliegenden Haarbüschelchen. An den Hintertarsen ist Glied 1 nur wenig kürzer als der Rest; 4 gleicht 2 + 3, 3 gleicht der Hälfte des zweiten, 2 gleicht der Hälfte des ersten.

Länge, 6.6 bis 6.9 Millimeter; Breite, 3.5 bis 3.8.

Vier Männchen und 5 Weibchen in den Sammlungen Stettin, München, und Gebien.

Sumatra, Soekaranda (*Dohrn*); Bekantiang (*Dohrn*). Borneo, Sarawak (*Wallace*).

Von allen Arten ausser *rubromarginatus* durch nur zwei Flecken auf den Flügeldecken verschieden. Auch die Anordnung der Haare auf der Unterseite und die eingentümliche Hornbildung der Männchen sind gute Merkmale.

Ischnodactylus rubromarginatus Chevrolat. Tafel 1, Fig. 3.

Ischnodactylus rubromarginatus CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 242.

Klein, oval, ziemlich gewölbt, schwarz glänzend, die ersten drei Fühlerglieder, die Beine, und der Rand der Decken rotbraun, die Flecken gelblich.

Der Kopf ist ausserordentlich stark quer, fast doppelt so breit wie lang, die Stirn ist vorn nur halb so breit wie ein Auge, diese sind schräg nach innen gerichtet, vorn am nächsten, das sehr schmale Epistom ist nicht länger als die Stirn vorn. Die Sei-

ten des Kopfes sind nach vorn sehr stark verengt, der Clypeusrand ist gerade, nicht aufgebogen, sondern etwas gewölbt, die Clypealnaht liegt dem Auge hart an. Beim Männchen finden sich im Nacken zwei gerade, riemenförmige, direkt nach vorn gerichtete Hörner, die an der Spitze ein Pinselchen sehr langer Haare tragen, die als solche nur unter starker Vergrösserung erkennbar sind, da sie nur eine Verlängerung der Hörner bilden. Die Stirn unter den Hörnern ist breit grubig vertieft, die Oberfläche beim Männchen fast glatt, beim Weibchen deutlich punktiert. Die Fühler sind dick, glänzend, Glied 4 ist so lang wie 3, so breit wie lang, kaum schmäler als die folgenden, die andern Glieder sind 1.5 mal so breit wie lang, und haben kaum verrundete obere Ecken. Das Mentum des Männchens hat eine flache Grube mit einem kaum sichtbaren Haarpinselchen.

Der Halsschild ist über doppelt so breit wie lang, verhältnismässig stark gewölbt, besonders an den Seiten nicht verflacht, die Seitenränder sind kräftig gerundet, der Vorderrand ist gerade abgestutzt, die Hinterecken sind stumpfwinklig, die Punktierung ist fein, aber sehr deutlich, mässig dicht, es sind nur die basalen Eindrücke vorhanden.

Die Flügeldecken sind ziemlich gewölbt, sie haben Reihen zwar sehr feiner, aber doch viel deutlicherer Punkte als bei den ganz flachen Arten, die Zwischenräume sind vollkommen flach, nur die äusseren leicht gewölbt, der Rand ist vorn sehr schmal, hinten viel breiter verflacht. Jede Decke hat nur vorn einen grossen, runden, gelben Fleck, der breiter ist als der Raum vor ihm, er nimmt die Zwischenräume 3, 4, und 5 ganz ein, meist auch 6 und den grössten Teil von 2. Der dritte und fünfte Zwischenraum sind dort nur wenig verbreitert.

Die Unterseite hat auch beim Männchen keine Behaarung. An den Hintertarsen ist Glied 1 wesentlich kürzer als der Rest.

Länge, 4.3 bis 6.2 Millimeter; Breite, 2.5 bis 3.4.

Fünf Männchen und 24 Weibchen in den Sammlungen Berlin, Stettin, München, und Gebien.

Sumatra, Soekaranda, Januar, 1894 (*Dohrn*); Liangagas (*Dohrn*); Ober Langkat, Deli (*Reinsch*). Malacca, Perak (*Jachau*). Penang.

Diese Art hat wie *I. colon* nur zwei Flecke auf den Decken, die aber viel grösser sind, auch ist *colon* viel flacher und hat aussen gefurchte Decken. Ferner ist die Bewaffnung des Kopfes beim Männchen ganz anders.

Die Type Chevrolat's in der ehemaligen Sammlung Haag in München ist ein Weibchen. Chevrolat glaubt dass diese Art mit *Platydema* (*Histeropsis*) *quadrispilotum* zusammenfällt, und das Weibchen von ihm sei. Das ist ein grosser Irrtum, schon die Zeichnung ist ganz anders; auch hat diese Art ein einzelnes, gerades, dickes Horn auf dem Kopfe des Männchens.

Ischnodactylus gradatus sp. nov.

Lang oval, ziemlich gewölbt, glänzend schwarz, Fühler, Epipleuren, Hörner, Beine, und Flecken der Decken rot.

Der Kopf ist stark quer, aber nicht annähernd so stark wie bei voriger Art, vorn nur schwach verkürzt, die Augen sind innen fast eckig, die Stirn ist dort nur ein Drittel so breit wie ein Auge. Die Seiten des Vorderkopfes verengen sich sehr schnell und stark, das Epistom ist gerade abgestutzt, ganz flach, und geht unmerklich in die Gelenkhaut über. Die Wangen sind vor den Augen schwach vertieft. Die Hörner sind beim gut entwickelten Männchen zuerst ziemlich kräftig, fast senkrecht ansteigend, dann wagerecht über dem Kopf liegend, an der Spitze mit unscheinbarem Haarpinselchen versehen, das sehr kurz ist. Am Grunde sind die Hörner breit riemenförmig, dann plötzlich stufenförmig verengt und im weiteren Verlauf rund, bei einem andern Männchen dagegen ohne deutliche Stufe. Die Stirn unter den Hörnern ist muldig vertieft und mit einzelnen gröberen Punkten versehen. Die Fühlerglieder sind rundlich, so breit wie lang. Des Mentum hat eine schwache Grube mit einem undeutlichen Haarpinselchen.

Das Pronotum ist über 2.5 mal so breit wie lang, zwar flach aber an den Seiten doch kräftig abwärts gebogen und gewölbt, die Seitenränder sind stark gebogen, nach hinten fast etwas verengt, der Vorderrand ist gerade abgestutzt, die Vorderecken sind sehr breit verrundet, die Hinterecken sehr stumpf. Ausser den beiden basalen Grübchen findet sich kein weiterer Eindruck. Die Punktierung ist kaum sichtbar.

Die Flügeldecken sind flach, mit sehr feinen Punktreihen oder Streifen versehen, deren Punkte aber viel deutlicher als bei den meisten andern Arten sind, die inneren Zwischenräume sind ganz flach, auf den Flecken nicht verbreitert, die äusseren kräftig gewölbt. Der Rand und die Spitze der Decken sind bräunlich durchscheinend. Jede Decke hat zwei grosse, runde Flecke: der vordere im ersten Drittel ist ungefähr so breit wie der Raum zwischen ihn und der Basis, er nimmt die Zwischenräume 3 bis

6 ganz ein und die Hälfte von 2. Der hintere Fleck ist ebenfalls kreisrund, aber mehr verwaschen und etwas kleiner als der vordere.

Die Unterseite ist beim Männchen auf dem Prosternum, dem Metasternum hinten, und den ersten Abdominalsegmenten ganz leicht behaart. An den Hintertarsen ist Glied 1 länger als 4.

Länge, 4.8 bis 5.2 Millimeter; Breite, 2.8 bis 3.

Drei Männchen, davon eines mit abgebrochenen Hörnern, im Museum Stettin, von denen mir eines für meine Sammlung überlassen wurde.

Sumatra, Soekaranda (*Dohrn*); Liangagas (*Dohrn*).

Der verhältnismässig kräftig gewölbte Körper weist dieser Art einen Platz an neben *I. rubromarginatus*, von dem sie sich durch die Färbung (zwei statt eines Fleckens) und die Kopfbildung des Männchens sicher unterscheidet. Vier Flecken hat ebenfalls *I. batesi*, ist aber grösser, sehr flach, die Flecken sind klein, der Kopf ganz anders. Auch *I. quadrioculatus* ist weit entfernt.

Ischnodactylus mirabilis Gebien. Tafel 1, Fig. 4 und 5.

Ischnodactylus mirabilis GEBIEN, Notes Leyd. Mus. 36 (1914) 64.

Von dieser Art liegt mir auch jetzt ausser den beiden Typen (Männchen, Weibchen) kein weiteres Material vor. Der ausführlichen Beschreibung an andern Ort ist nichts hinzuzufügen. Ueber die Verwandtschaftsbeziehungen zu *I. batesi* und *I. sexguttatus* wird dort berichtet.

Simalur, Sinabang, Juli, 1913 (*Jacobson*).

Ischnodactylus batesi Chevrolat. Tafel 1, Fig. 6.

Ischnodactylus batesi CHEVROLAT, Bull. Soc. Ent. France (1878) LXXXVIII.

Diese Art ist etwas grösser als die vorige, im übrigen ihr aber ähnlich, die Flügeldecken sind jedoch an den Seiten fast einfach gestreift punktiert, bei *mirabilis* tief gefurcht, ebenso an der Spitze; der vordere Fleck liegt bei *batesi* vor, bei *mirabilis* im ersten Drittel, ist bei letzterer Art quer, bei *batesi* ganz rund.

Unter den 10 mir vorliegenden Tieren sind 4 Männchen, aber nur eines hat die charakteristischen Hörner, sie sind dünn, und wie bei *mirabilis* gestaltet, am Ende also nackt; die anderen 3 Männchen (durch dreieckig vorgezogenen, stark aufgebogenen Clypeus vom Weibchen unterschieden) haben keine Spur von Horn. Ich finde bei keiner andern Art etwas ähnliches. Wohl finden sich, wie bei allen gehörnten Käfern, graduelle Unterschiede in der Entwickelung der Hörner; aber der unvermittelte

Gegensatz zwischen vorzüglich entwickelten Hörnern und deren gänzliches Fehlen bei unserer Art ist sehr auffällig. Weiteres Material muss zeigen ob sich Uebergänge finden oder ob bei den Männchen zwei Rassen angenommen werden müssen. Beim Weibchen, das einen abgestutzten Clypeus hat, finden sich ganz im Nacken zwei stark genäherte Körnchen statt der Hörner, sind aber meist unter dem Vorderrand des Halsschildes verborgen.

Vier Männchen und 6 Weibchen, in den Sammlungen Stettin und Gebien.

Sumatra, Soekaranda (*Dohrn*); Liangagas (*Dohrn*).

Ischnodactylus trigonalis sp. nov.

Flach, braun, glänzend.

Der Kopf ist beim Weibchen stark quer, beim Männchen so breit wie lang, die Augen treten stark, fast konisch vor, von ihnen an ist der Kopf beim Männchen stark spitzbogig dreieckig verengt, das Epistom ist stark aufgebogen, hat aber im vorderen Winkel keine aufgesetzte Spitze. Die Stirn ist hinten breit muldig vertieft. Die Hörner des Männchens sind dünn, lang, liegen zuerst der Stirn an und sind dort verflacht, sie steigen dann senkrecht aufwärts, die Hörner sind an den Seiten nicht verbreitert abgesetzt, sondern schlank, am Ende fehlt ein Haarbüschel. Der ganze Vorderkopf ist stark vertieft, beim Weibchen ist sein Rand von Auge zu Auge halbkreisförmig und kräftig aufgebogen. In beiden Geschlechtern ist die halbkreisförmige Querfurche gut ausgeprägt, beim Weibchen hat die Stirn hinten zwei eng aneinander liegende Tuberkeln. Die Fühler sind schlank, Glied 3 gleich 4, die folgenden sind beim Männchen so breit wie lang, fast kugelig, aber flach, beim Weibchen deutlich quer. Das Kinn des Männchens mit der gewöhnlichen, mit Haarpinsel versehenen Grube.

Der Halsschild ist sehr flach, die Seiten sind etwas flachgedrückt, an der Basis finden sich die gewöhnlichen zwei Gruben, die Seiten sind in der Endhälfte fast parallel, die Vorderecken sind stumpfwinklig und an der äussersten Ecke kaum verrundet, die hinteren scharf, fast rechtwinklig, beim Männchen ist der Vorderrand kräftig ausgeschnitten.

Die Flügeldecken sind flach, der Seitenrand ist hinten nicht deutlich breiter. Die Punkte der Reihen sind recht kräftig, die seitlichen Streifen sind furchig vertieft, die Zwischenräume an der Spitze stärker gewölbt. Jede Decke hat zwei runde, ziemlich grosse Flecken, beide ungefähr von der Grösse zweier Zwi-

schenräume, der vordere hat einen so grossen Durchmesser wie sein Abstand von der Basis. Der fünfte Zwischenraum ist auf dem Fleck verbreitert. An den Hintertarsen ist Glied 1 kürzer als der Rest.

Länge, 6.2 bis 7.8 Millimeter; Breite, 3.3 bis 4.

Ein Pärchen von Borneo, Sarawak (*Doria* leg.) im Museum Berlin.

Aus der Beschreibung geht die nahe Verwandtschaft dieser Art mit *I. mirabilis* hervor. Wenn nicht bei unserer Gattung die Zeichnung sehr konstant wäre, würde ich geneigt sein vorstehende Art als ausgeprägte Lokalrasse von *I. mirabilis* anzusehen. Aber die Zeichnung ist abweichend; der vordere Fleck ist nicht quer, sondern rund und so gross wie der Raum vor ihm. Ferner sind die äusseren Zwischenräume schwach gefurcht, die Fühlerglieder des Männchens nicht quer, sondern so breit wie lang, beim Weibchen quer; ausserdem ist die Färbung nicht ein glänzendes Schwarz, sondern ziemlich hell braun.

Ischnodactylus nasutus sp. nov. Tafel 1, Fig. 7.

Gross, sehr flach, glänzend schwarz, Flügeldecken mit je zwei hellen Flecken, Schenkel mehr oder minder braun oder gelbbraun, Epipleuren, oft auch die Hüften und Ränder des Kopfes braun.

Der Kopf hat schräg nach vorn gerichtete Augen, die sich vorn bis auf einen Zwischenraum nähern, kaum grösser als das dritte Fühlerglied lang. Die Stirn ist in beiden Geschlechtern der Länge nach eingedrückt, hinten finden sich beim Weibchen zwei genäherte rundliche Körner, beim Männchen zwei lange, steil aufgesetzte, etwas nach hinten gerichtete Hörner. Diese sind schmal, parallelseitig, riemenförmig, also von vorn nach hinten flach gedrückt, nicht sehr spitz, und haben am Ende keinen Haarschopf; von der Seite gesehen erscheinen sie leicht nach vorn gebogen. Der Vorderkopf ist stark entwickelt, die Ränder sind breit aufgebogen, das Epistom ist gerade abgeschnitten, aber in beiden Geschlechtern in der Mitte ausgezeichnet. Beim Männchen findet sich dort ein ziemlich langes, wagerecht nach vorn vorgezogenes, seitlich kompresses Horn, dessen Oberkante kielförmig ist. Von der Seite gesehen ist dieses Horn ganz wagerecht, etwas dreieckig, und geht hinten direkt in den hinteren Teil des Epistoms über. Beim Weibchen findet sich an derselben Stelle eine mehr oder minder spitze Tuberkel. Die Ecken des Epistoms sind in beiden Geschlechtern, beim Männchen mehr, kräftig grubig eingedrückt. Die Clypealsutur ist

halbkreisförmig, gut eingeschnitten, die Punktierung kaum wahrnehmbar fein. Die Fühler sind in beiden Geschlechtern ziemlich gleich, beim Männchen ist das vierte Glied wesentlich länger als an der Spitze breit, beim Männchen nur schwach länger, oder so breit wie lang, die folgenden sind beim Männchen fast kugelig, so breit wie lang, beim Weibchen etwas quer; das letzte Glied hat eine helle Spitze. Das Mentum hat beim Männchen eine fast kreisförmige, am Grunde flache Grube ohne starken Rand, in der Mitte mit winzigem Haarbüschelchen.

Der Halsschild ist sehr flach, an der Basis reichlich 2.5 mal so breit wie in der Mittellinie lang. Die Seiten sind ganz verflacht und haben eine äusserst feine Randlinie. Die Linie an der sanft ausgeschnittenen Spitze ist vollständig, die Seiten sind in der Endhälfte parallel, die Vorderecken ziemlich breit verrundet, die Basiswinkel scharf, aber stumpf. An den Seiten findet sich eine flache, undeutliche Grube, die basalen Eindrücke sind recht tief und deutlich. Die Punktierung ist ausserordentlich fein und nicht dicht, beim Weibchen nur unter sehr starker Vergrösserung sichtbar; dem schwach bewaffneten Auge erscheint die Oberfläche glatt.

Die Flügeldecken sind sehr flach, sie haben je zwei sehr grosse Flecke, von denen der vordere schwach quer und etwas schräge zur Schulter gerichtet ist, viel breiter als der Raum an der Basis vor ihm, sein Vorderrand ist nicht gezackt, der Hinterrand etwas uneben; der Fleck lässt nur den Nahtstreif und die beiden äusseren Zwischenräume ganz, den zweiten zur Hälfte frei. Der Spitzenfleck ist fast kreisrund und nimmt die Streifen 4 bis 6 ein. Die Zwischenräume 3 und 5 sind auf dem vorderen Fleck mässig stark verbreitert. Auf der Scheibe sind alle Zwischenräume vollkommen flach, die Punktlinien sehr fein, nicht eingeschnitten; die seitlichen dagegen bilden Furchen, aber schwächer als bei vielen andern Arten, dort sind die Interstitien ebenso wie an der Spitze gewölbt. Die Unterseite zeigt beim Männchen nur in der mittleren Längslinie Spuren von Behaarung.

Länge, 6.3 bis 7.8 Millimeter; Breite, 3.3 bis 3.9.

Zwei Männchen und 1 Weibchen in meiner Sammlung, 2 Weibchen in der des Britischen Museums.

Philippinen, Basilan; Mindanao, Iligan; Mindanao, Kolambugan (*Baker* leg.).

Die Stücke wurden von Herrn Professor Baker unter den Nummern 11651, 14100, und 14110 mitgeteilt.

Diese Art erinnert wegen der grossen Flecke an *I. quadriocu-latus*, hat aber andere Zeichnung, fast glatten Halsschild, und ganz andere Kopfbildung der Männchen. Dieses hat nämlich zwei lange Nackenhörner und ein Clypealhorn, die der alten Art fehlen; ausserdem sind die Flügeldecken an den Seiten tief gefurcht.

Ischnodactylus fenestratus sp. nov. Tafel 1, Fig. 8.

Mässig flach, glänzend braunschwarz, Flügeldecken mit je zwei sehr grossen Flecken; Unterseite, Beine, und Fühler gelbbraun.

Kopf zwischen den Augen nicht eingedrückt, beim Weibchen ohne Körner oder Hörnchen, die Stirn vorn etwas breiter als das dritte Fühlerglied lang, der sehr kurze Vorderkopf nicht länger als die Stirn vorn breit. Das Epistom hat kurz verrundete Ecken und ist vorn gerade, ohne jegliche Auszeichnung abgestutzt. Die Punktierung ist zwar sehr fein, aber deutlich. Die Fühler sind ganz hell, Glied 3 gleich 4, dieses etwas länger als breit, die folgenden sind gleich, schwach quer, das letzte is birnförmig, 1.5 mal so lang wie breit. Das Mentum hat eine kreisrunde, scharf begrenzte Grube mit einem zentralen, starken Haarpinsel.

Der Halsschild ist von der Basis an nach vorn verengt, an den Seiten nicht verflacht, sondern die quere Wölbung geht bis an den Rand. Die Spitzenrandung ist in der Mitte unterbrochen, der Rand selbst, von oben gesehen, schwach ausgeschnitten. Die Punktierung ist sehr fein, aber auch bei schwacher Vergrösserung deutlich.

Die Flügeldecken haben je zwei grosse, gelbe Flecken: der vordere ist fast kreisförmig, über doppelt so breit wie der schwarze Saum an der Basis und viel breiter als die schwarze Querbinde der Decken hinter ihm; er reicht hinten bis zur Mitte der Decken und lässt an beiden Seiten nur den Nahtstreif und den Streif über dem Seitenrand frei. Der hintere Fleck nimmt die ganze Spitze ein, und nur der hinterste Teil und die Naht selbst bleiben dunkler. Die Punktlinien sind ausserordentlich fein, nur an der Spitze ganz leicht vertieft. Die Zwischenräume sind vollkommen flach, auch an den Seiten; der verflachte Seitenrand ist sehr schmal abgesetzt.

Länge, 5.5 Millimeter; Breite, 3.

Ein Weibchen von Borneo, Sandakan (*Baker*); ein Weibchen im Museum Leyden von Nordost Sumatra, Tandjong Morawa, Serdang (*Hagen.*)

Diese Art ist so grossfleckig wie keine andere. Bei dem ähnlich gezeichneten *I. sumbawicus* bildet der vordere Fleck eine breite Binde, übrigens ist bei dieser Art die Kopfbildung eine ganz andere als bei *I. fenestratus*. Eine gewisse Aehnlichkeit zeigt auch *I. quadrioculatus* von Java, ist aber grösser, hat kräftig vorragende Ecken des Pronotums, kleinere Flecke, und langen Vorderkopf.

Ischnodactylus bimaculatus sp. nov.

Diese Art ist neben *I. colon* zu stellen, mit welchem sie in allen wesentlichen Merkmalen übereinstimmt, doch ist sie kleiner. Fühler und Beine sind gelbrot, die Unterseite ist braun. Der einzelne Fleck jeder Decke ist gross, rund, und nimmt die Zwischenräume 3 bis 6 ganz ein, geht aber auch auf 2 und 7 über. Nur der fünfte Streif ist auf ihm leicht verbreitert. Der Fleck ist viel breiter als der schwarze Raum vor ihm. Die Decken sind nahezu parallelseitig; die stumpfwinklige Erweiterung vorn fehlt also. Ein weiterer scharfer Unterschied liegt in der Kopfbildung; es finden sich nämlich scharfe und lange wenn auch schmale Augenfurchen am Innenrande der Augen, welche dem *I. colon* fehlen. Von *I. rubromarginatus*, der in der Zeichnung ähnlich ist, unterscheidet sich unsere Art durch den flacheren Körper mit dunklem Rand, an den Seiten tief gefurchte Flügeldecken, viel breitere Hinterschienen.

Länge, 5.6 Millimeter; Breite, 2.9.

Ein Weibchen von den Philippinen, Mindanao, Kolambugan (*Baker*), in meiner Sammlung; ein Weibchen von Luzon, Mount Maquiling (*Baker*), im Museum Dresden.

Ischnodactylus bakeri sp. nov.

Flach, glänzend schwarz, Unterseite dunkelbraun, Fühler und Beine gelbbraun; Flügeldecken mit dunkel blutroten Flecken.

Der Kopf ist zwischen den Augen vorn schwach und nicht scharf eingedrückt, Nackenhörner fehlen dem Männchen, auch sind dort keine deutlichen Tuberkeln vorhanden. Die Stirn ist vorn kaum breiter als das dritte Fühlerglied lang. Der Vorderkopf ist kräftig entwickelt, beim Männchen aber nicht dreieckig vorgezogen, doch sind die Ränder in beiden Geschlechtern aufgebogen. Beim Männchen ist die Mitte des gerade abgestutzten Epistoms durch eine kurze, nicht auffällige, dreieckige Spitze markiert, beim Weibchen ist der Vorderrand gerade. Augenfurchen fehlen. Die Punktierung ist sehr deutlich und ziemlich dicht, die Clypealsutur ist scharf eingeschnitten. An

den Fühlern ist Glied 4 gleich 3, beim Weibchen etwas breiter als beim Männchen; die vorletzten Glieder sind so lang wie breit. Mentum beim Männchen mit dem normalen, etwas queren, scharf begrenzten Grübchen, das in der Mitte behaart ist.

Das Pronotum ist an den Seiten ganz verflacht und dort mit der Spur einer flachen Grube versehen, auch die basalen Grübchen sind recht deutlich. Die Punktierung ist zwar äusserst fein, aber unter der Lupe sehr deutlich. Die Spitze ist sehr fein und vollständig gerandet, von oben gesehen nicht deutlich ausgeschnitten, die Vorderecken sind breit verrundet, die hinteren ziemlich scharf rechtwinklig.

Die Flügeldecken haben blutrote, nicht sehr grosse Flecke, die wegen ihrer dunklen Farbe nicht sehr deutlich sind. Der vordere ist schwach quer und nimmt die Zwischenräume 3 bis 5 ganz, 2 und 6 zur Hälfte ein, die Zwischenräume 3 und 5 sind auf dem Fleck etwas verbreitert. Der hintere Fleck ist fast kreisrund, er nimmt die Interstitien 2 bis 4 ein. Der Seitenrand der Flügeldecken ist hinter der Schulter sehr schwach und stumpf, undeutlich gewinkelt. Alle Zwischeräume sind an der Spitze stark gewölbt, die Streifen tief gefurcht, an den Seiten sind die äussersten fünf Streifen furchig vertieft. Die Unterseite des Männchens ist nicht behaart. An den Hintertarsen ist Glied 1 viel kürzer als der Rest.

Länge, 6.5 bis 7 Millimeter; Breite, 3.2 bis 3.5.

Ein Pärchen von den Philippinen; Männchen von Mindanao, Kolambugan; Weibchen von Bukidnon, Tangkulan (*Baker* leg.).

Diese Art unterscheidet sich leicht von den andern beiden philippinischen Arten (*bimaculatus* und *nasutus*) durch ganz andere Kopfbildung und die Zeichnung; auch die an den Seiten tief gefurchten Flügeldecken sind ein gutes Kriterium, denn bei *I. nasutus* sind nur die äusseren drei Streifen tief gefurcht und die andern schwach. Näher noch steht *I. trigonalis* von Borneo, aber hier ist der ganze Vorderkopf dreieckig vorgezogen, bei unserer Art abgestutzt und die Mitte des Epistoms hat beim Männchen eine aufgesetzte Spitze, die Flecken sind bei unserer Art grösser und blutrot, die äusseren Streifen tief gefurcht, und dem Männchen fehlen die Hörner im Nacken.

Ischnodactylus sexguttatus sp. nov. Tafel 2, Fig. 1.

Sehr flach, oval, glänzend schwarzbraun, Unterseite rotbraun, Fühler, Mundteile, und Beine hell braun.

Der Kopf ist stark quer, die Augen quellen stark aus der Wölbung des Kopfes und sind im oberen Teil schräg nach vorn

gerichtet, die Stirn zwischen ihnen ist kaum halb so breit wie der obere Teil eines Auges, sie ist der Länge nach breit eingedrückt, nicht eigentlich gefurcht, hinten finden sich bei den beiden Männchen keine Hörner, sondern nur zwei genäherte Tuberkeln. Der Vorderkopf ist von den Wangen an halbkreisförmig mit geradem Epistom, dort in der Mitte kurz zapfenförmig vorspringend, nicht dreieckig. Die Wangen sind blattdünn, an den Seiten etwas aufgebogen, aber nicht vorn. Beim Weibchen fehlt das Zähnchen des Epistoms und die Stirn ist etwas breiter und deutlicher punktiert. Die Oberlippe ist quer gekielt. Die Fühler sind schlank, Glied 3 ist doppelt so lang wie dick, nicht länger als 4, dieses zur Spitze verdickt, aber viel länger als breit, die folgenden sind alle nach dem Ende zu rundlich erweitert, etwas länger als breit, das Endglied ist lang elliptisch. Das Kinn ist nach vorn sehr stark verbreitert, aber viel länger als breit mit verflachten Seitenlappen. Die Scheibe ist beim Weibchen fein begrenzt, beim Männchen mit starker Grube, die Behaarung trägt.

Der Halsschild ist auffallend flach, mit schmalem Basalmittellappen, die Spitze ist in breitem Bogen flach ausgerandet, mit feiner Randlinie versehen; ausser den beiden basalen Grübchen finden sich zwei sehr flache Eindrücke am Seitenrand, die Hinterecken sind stumpfwinklig, die Vorderecken breit verrundet.

Die Flügeldecken sind sehr flach, die Seiten nicht gleichmässig gerundet, hinter der Schulter am breitesten. Die Seiten sind etwas durchscheinend braun. Auf jeder Decke sind drei Flecken vorhanden: die vorderen beiden liegen nebeneinander im ersten Drittel im dritten und fünften Zwischenraum, der hintere Fleck liegt im letzten Drittel im dritten und vierten Zwischenraum, geht aber oft auch auf den zweiten über, die vorderen sind schwach länglich. Es sind Reihen äusserst dicht stehender, sehr feiner, eingestochener Punkte vorhanden. Die ersten Zwischenräume sind ganz flach, die äusseren kräftig gewölbt, der dritte und fünfte sind auf den vorderen Flecken leicht verbreitert. Alle Zwischenräume sind sehr fein und ziemlich dicht punktiert.

Die Unterseite ist auch beim Männchen nackt, weder auf dem Prosternum noch auf dem Abdomen finden sich Haarflecke. Das Prosternum ist hinten sehr spitz, das Mesosternum scharf V-förmig ausgeschnitten. Die Propleuren sind nicht deutlich längsgestrichelt, aber die Seiten des Abdomens. Die Hinterschenkel sind dreimal so lang wie dick. An den Hintertarsen ist Glied 1 so lang wie der Rest.

Länge, 6.8 bis 7.2 Millimeter; Breite, 3.5 bis 3.8.

Drei Männchen und 5 Weibchen in den Sammlungen Berlin, Stettin, Gebien, und München.

Sumatra, Soekaranda, Januar, 1894 (*Dohrn*) ; Ober Langkat, Deli (*Ude*) ; Tebing-tinggi, 17ten Januar, 1885 (*Schultheiss*). Borneo, Sandakan (*Baker*).

Diese Art ist dem *I. bisetiger* verwandt und hat wie diese Art sechs Flecken. Die vorderen liegen aber eng nebeneinander, bei *bisetiger* weit auseinander (der zweite an der Schulter). Die Kopfbildung des Männchens (das fehlende Stirnhorn, der gezähnte Clypeus) unterscheidet die Arten leicht. Das Weibchen ist von *I. mirabilis* kaum zu unterscheiden, und nur daran zu erkennen dass der Fleck geteilt ist.

Ischnodactylus bisetiger sp. nov. Tafel 2, Fig. 2.

Sehr flach, glänzend schwarzbraun, Vorderkörper etwas heller, Unterseite rotbraun, Fühler und Beine gelbbraun.

Der Kopf ist stark quer, die Augen sind ganz vorn am nächsten, während bei der vorigen Art die Innenecken breit verrundet sind, die grösste Breite also weiter, die Stirn hinaufgerückt ist, diese ist kaum halb so breit wie eines der stark vorquellenden Augen, beim Männchen ganz flach, beim Weibchen der Länge nach sehr schwach eingedrückt, in diesem Geschlecht deutlich punktiert, beim andern glatt. Im Nacken entspringen zwei haardünne, flachgedrückte, zuerst dem Kopf anliegende, wie angeklebte, sehr lange Hörner, die nach vorn leicht gebogen sind, sie sind bis zum Grunde gleich dünn. Der Vorderkopf ist auffallend kurz, die Wangen sind fast geradlinig stark verengt, die Länge des Epistoms (also von vorn nach hinten gemessen) ist kaum grösser als die schmalste Stelle der Stirn zwischen den Augen. Vor diesen befindet sich auf den Wangen ein starker Eindruck, welcher den Rand aufbiegt. Die Vorderecken ragen schwach vor, dadurch erscheint das Epistom leicht ausgebuchtet, seine Mitte ist beim Männchen leicht winklig angedeutet. Der Vorderteil des Kopfes ist in beiden Geschlechtern fein und deutlich punktiert. Die Fühler sind schlank, Glied 3 gleich 4, dieses ist leicht verdickt, die folgenden sind sämtlich rundlich erweitert, so breit wie lang. Das Kinn hat beim Männchen eine starke, behaarte Grube.

Der Halsschild ist sehr flach, reichlich doppelt so breit wie in der Mittellinie lang, der basale Mittellappen ist kurz, die Seiten sind zuerst schwächer, dann stärker nach vorn verengt. Die Hinterecken sind scharf rechtwinklig, Eindrücke an den

Seiten fehlen, nur die basalen sind sehr deutlich, die Punktierung ist sehr fein und oberflächlich.

Die Flügeldecken haben einen durchscheinenden Rand, die Skulptur ist wie bei voriger Art, nur die Fleckenbildung ist anders. Es finden sich ebenfalls auf jeder Decke drei Flecken: ein rundlicher im letzten Drittel, der den dritten und vierten und einen grossen Teil des zweiten Zwischenraumes einnimmt; ein zweiter Fleck liegt vor dem ersten Drittel, er ist ebenfalls rund oder schwach dreieckig und geht über den dritten und vierten bis in den fünften Zwischenraum; der dritte Fleck ist länglich, manchmal undeutlich, und findet sich im achten Zwischenraum dicht hinter der Schulter. Auf dem vorderen Fleck sind die Zwischenräume nicht verbreitert. Unterseite und Beine zeigen gegen die vorige Art keine Abweichungen.

Länge, 5.9 bis 6.8 Millimeter; Breite, 3 bis 3.5.

Zwei Männchen und 9 Weibchen in den Sammlungen Stettin, Dahlem, und Gebien.

Sumatra, Soekaranda, Januar, 1894 (*Dohrn*); Tebing-tinggi (*Schultheiss*).

Von allen Arten durch die Anordnung der Flecken geschieden. Von der sehr ähnlichen vorigen Art durch die Kopfbildung leicht zu unterscheiden; es fehlt eine Längsfurche auf der Stirn, das Epistom hat kein Zähnchen, aber es finden sich zwei haardünne lange Hörner auf dem Hinterkopf. *Ischnodactylus mirabilis* und *batesi* haben ein eckig vorgezogenes Epistom und andere Fleckenbildung.

Ischnodactylus quadrioculatus Chevrolat. Tafel 2, Fig. 3 und 4.

Ischnodactylus quadrioculatus CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 178.

Ischnodactylus quadridentatus CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 173.

Ich habe die Type dieser Art nicht gesehen. Ihre Deutung auf die mir vorliegenden Stücke von Java ist also nicht ganz ohne Zweifel. Nach diesen gebe ich eine neue Beschreibung:

Sehr flach, oval, Flügeldecken schwarz, Vorderkörper, Unterseite, Beine, und Fühler schwarzbraun, zwei Flecke auf jeder Flügeldecke hell gelb.

Kopf beim Männchen ohne Horn, so breit wie lang, die Augen quellen seitlich stark vor, sie sind schräg nach vorn gerichtet, vorn einander am nächsten, die Stirn zwischen ihnen ist beim Männchen fast so breit, beim Weibchen so breit wie ein Auge

von oben gesehen. Eine eigentliche Furche fehlt auf der Stirn, doch finden sich zwei feine Längsfältchen, die hinten etwas stärker erhaben sind. Der ganze Kopf ist in beiden Geschlechtern fein und oberflächlich punktiert, der Vorderkopf ist sehr lang, die Seiten sind geradlinig nach vorn verengt, die Ecken beim Männchen breit verrundet, beim Weibchen deutlich, das Epistom ist in ersterem Geschlecht stark aufgebogen und in der Mitte sehr stumpf gewinkelt, beim Weibchen schwach aufgebogen und in der Mitte gerade abgestutzt. An den Fühlern ist Glied 3 etwas länger als 4, 5 und die folgenden sind so breit wie lang. Das Mentum des Männchens hat eine runde, schlecht begrenzte, aber tiefe Grube, in deren Zentrum ein Haarpinsel steht.

Pronotum auffallend flach, mit vorragenden, von oben gesehen ziemlich spitzen, in der Randkante sehr kurz verrundet rechtwinkligen Vorderecken, die Hinterecken sind 90° gross, die Seiten schwach gebogen, in der Endhälfte fast parallelseitig, der Vorderrand ist kräftig ausgeschnitten. Die grösste Breite ist 2.5 mal so gross wie die Länge in der Mitte gemessen, ausser dem basalen Grübchen findet sich ein sehr flacher Eindruck am Seitenrand. Die Punktierung ist deutlich, aber fein und oberflächlich.

Die Flügeldecken sind hinter der Schulter etwas rundlich erweitert, mit ganz flachen, sehr fein, aber deutlich punktierten Zwischenräumen, die seitlichen sind nur leicht gewölbt. Die Flecken sind bei dieser Art sehr gross, die vorderen so gross wie der schwarze Raum vor ihnen, sie nehmen die Zwischenräume 3, 4, und 5 ein und gehen auch auf 2 und 6 über, 3 und 5 sind dort verbreitert. Der hintere Fleck ist bei den mir vorliegenden Tieren etwas verschieden, er ist ebenfalls fast kreisrund und reicht vom zweiten bis zum fünften oder siebenten Zwischenraum. Der verflachte Seitenrand ist hinten kaum verbreitert.

Die Unterseite ist beim Männchen kaum behaart, Haarflecken und Pinsel fehlen, die Hinterschienen sind bis zum Ende fast linear, an den Hintertarsen ist das erste Glied etwas kürzer als der Rest.

Länge, 7.5 bis 8.5 Millimeter; Breite, 3.8 bis 4.2.

Ein Pärchen von Java, Arjuno (*Doherty*) und ein Weibchen mit auffallend grossen Flecken, ohne Fundort, in meiner Sammlung. Ein weiteres Weibchen, ebenso wie das zuletzt erwähnte gefleckt, in der Sammlung Veth mit dem Fundort Java.

Diese Art ist an den grossen Flecken leicht kenntlich und ausserdem durch die Kopfbildung des Männchens, dem die

Hörner fehlen, ausgezeichnet. Dieses letztere Merkmal zeigt auch *I. sexguttatus*, hat aber ganz andere Zeichnung und besonders seitlich stark gewölbte Zwischenräume.

Ischnodactylus sumbawicus sp. nov. Tafel 2, Fig. 5.

Flach, oval, glänzend schwarz, die Ränder der Decken, die beiden ersten Fühlerglieder, und die Tarsen (an den Hinterbeinen nur die letzten drei Glieder) braun.

Der Kopf ist stark quer, die Augen quellen sehr stark vor, sie sind schräg nach vorn gerichtet, ganz vorn am nächsten aneinander stossend, dort ist die Stirn kaum halb so breit wie ein Auge oben, leicht vertieft, nicht eigentlich gefurcht, hinten ohne Auszeichnung. Der Vorderkopf ist in ungefähr ein Drittelkreisbogen verrundet, die Vorderecken vollständig geschwunden, das Epistom nur auf kurze Strecke gerade. Vor den Augen befindet sich ein tiefer, breiter Eindruck, wodurch die Wangen leicht aufgebogen erscheinen, das Epistom ist aber ganz flach. Die Punktierung (Weibchen) ist zwischen den Augen etwas gröber als vorn. An den Fühlern ist Glied 3 gleich 4, dieses ist aber schon verdickt, etwas länger als breit, die folgenden sind sämtlich quer, das letzte ist oval.

Der Halsschild ist über 2.5 mal so breit wie lang, mit sehr kleinem basalen Mittellappen. An der Basis finden sich zwei rundliche Grübchen und neben dem Seitenrand ein wenig deutlicher, flacher Eindruck. Die Seiten sind zuerst fast geradlinig, dann stärker nach vorn verengt, die Vorderecken sind breit verrundet, der Vorderrand ist flach ausgeschnitten, die Punktierung ist deutlich, aber fein und oberflächlich.

Die Flügeldecken haben in der Gestalt nichts Abweichendes und weisen die gewöhnlichen, äusserst feinen Punktlinien auf. Alle Zwischenräume sind ganz flach, nur hinten sind die äusseren leicht vertieft. Die Zeichnung ist charakteristisch: der vordere Fleck ist sehr breit und bildet eine Binde, welche vorn etwas zackig ist, sie lässt nur den Seitenrand und den ersten Streifen ganz, den zweiten zum Teil frei. Der Raum von der Binde bis zur Basis ist viel schmäler als die Binde. Der sehr grosse Hinterfleck lässt die beiden äusseren Zwischenräume ganz und die ersten zum Teil frei. Der dritte Zwischenraum ist auf dem Vorderfleck schwach, der fünfte deutlicher verbreitert. Unterseite und Beine zeigen nichts Bemerkenswertes. An den Hintertarsen ist Glied 1 kaum kürzer als der Rest.

Länge, 7 Millimeter; Breite, 3.7.

Ein Weibchen von Sumbawa, in meiner Sammlung.

Diese Art erinnert am meisten an *I. quadrioculatus*, besonders wegen der Grösse der Flecken, doch ist sie etwas kleiner, der Vorderkopf ist nicht trapezisch sondern kreisbogig, auf der Stirn fehlen die Längskielchen, die Vorderecken des Pronotums treten nicht winklig vor, ferner ist bei unserer Art der vordere Fleck zu einer breiten Binde ausgebildet, was sich bei keiner andern wiederfindet, auch sind Ober- und Unterseite schwarz statt braun.

Ischnodactylus unifasciatus sp. nov. Tafel 2, Fig. 6.

Oval, mässig flach, glänzend schwarzbraun, Decken mit einer gelben Binde vorn, ohne Spitzenfleck, Unterseite hellbraun, Fühler und Beine gelbrot.

Der Kopf ist viel breiter als lang, die Stirn ist vorn viel schmäler als ein Auge von oben gesehen, sie ist etwas vertieft aber der ganze Grund vollkommen eben, nur die Ränder hart am Auge etwas erhabener. Beim Männchen finden sich auf der Stirn in der Mittellinie zwei äusserst feine Längsfältchen unter den Hörnern, beim Weibchen ist die Stirn flach und sehr deutlich punktiert. Die Wangen sind geradlinig und stark verengt, das Epistom ist vorn breiter als die schmalste Stelle der Stirn, es ist auch beim Männchen gerade abgestutzt, flach angedrückt. Die Hörner des Männchens scheinen unter dem Vorderrand des Pronotums zu entspringen, sie liegen flach an und sind fast gerade, am Grunde nicht verwachsen, sehr schmal, zuerst verflacht, aber nach aussen nicht verbreitert, dann stielrund, am Ende ohne Haarschopf. Die Fühler sind in den Geschlechtern recht verschieden: beim Männchen sehr lang, alle Glieder sehr gestreckt, Glied 3 ist etwas länger als 4, beide sind fast zylindrisch, die folgenden sind lang gestreckt oval, über doppelt so lang wie breit, die vorletzten noch immer doppelt so lang wie breit; beim Weibchen ist Glied 3 viel länger als 4, dieses und die folgenden sind etwas länger als breit, schwach konisch. Das Mentum wird beim Männchen von einer tiefen Grube eingenommen, die behaart ist und vorn einen spitzen Haarschopf trägt.

Der Halsschild ist an der Basis 2.5 mal so breit wie in der Mittellinie lang, die Seiten sind im Enddrittel parallel, die vordere Wölbung ist sehr flach und geht direkt bis zur Randkante. Es sind nur die beiden basalen Eindrücke vorhanden, die Hinterecken sind scharf stumpfwinklig, die vorderen verrundet, die Punktierung ist beim Weibchen viel stärker als beim Männchen.

Die Flügeldecken sind nicht sehr flach, der Seitenrand ist von oben breit sichtbar, er ist nach hinten nicht verbreitert,

die Seiten sind hinter der Schulter nur schwach erweitert. Die Punktreihen sind äusserst fein, die Zwischenräume vorn ganz flach, nur die äussersten auch dort gewölbt, hinten sind die Punktreihen furchig. Auf der Binde vorn sind die Zwischenräume 3 und 5 nur undeutlich breiter als die andern. Es ist nur eine helle Binde vorhanden, ein Spitzenfleck fehlt, diese Binde ist etwa so breit wie der dunkle Raum vor ihr an der Basis, sie lässt nur den ersten und letzten Zwischenraum frei und verbreitert sich auf dem dritten und fünften nach vorn und hinten etwas zackenförmig.

Die Unterseite ist auch beim Männchen nackt, das Prosternum vorn deutlich gekielt. An den Hintertarsen ist Glied 1 deutlich kürzer als der Rest.

Länge, 5.5 bis 8 Millimeter; Breite, 3 bis 4.

Ein Männchen und 8 Weibchen im Museum Berlin und in meiner Sammlung.

Ober-Assam (*Hartert* leg.).

Abgesehen von der Zeichnung, die recht abweichend ist, unterscheidet sich unsere Art durch die auffällig langen Fühlerglieder, namentlich beim Männchen. Uebrigens ist auch die Hornbildung beim Männchen charakteristisch, sie erinnert am meisten an die von *I. mirabilis* bei dem sie aber zuerst dem Kopfe anliegen und sich dann erheben. Am nächsten steht unserer Art die folgende, die sich wenig unterscheidet.

Ischnodactylus formosanus sp. nov.

Die ausführliche Beschreibung der vorigen Art passt genau auf diese, so dass ich auf sie verweisen kann. Die Unterschiede sind folgende:

Oberseite glänzend schwarz, die Hörner des Männchens liegen zuerst auf kurze Strecke dem Kopf an und sind daher schwach S-förmig gekrümmt, die Fühlerglieder des Männchens sind nur wenig länger als breit, unter den Hörnern fehlt das zarte Längsfältchen, beim Weibchen ist die Stirn fast glatt. In beiden Geschlechtern ist die helle Querbinde der Decken viel schmäler als der dunkle Raum vor ihr, sie geht innen kaum bis auf den zweiten Zwischenraum, den sie bei der vorigen Art ganz einnimmt.

Länge, 7 bis 7.2 Millimeter; Breite, 3.7 bis 3.8.

Zwei Männchen und 1 Weibchen im Museum Berlin, von denen mir ein Männchen freundlichst für meine Sammlung überlassen wurde.

Formosa, Hoozan, Januar, 1910; Fuhosho, Juli, 1909 (*Hans Sauter*).

Ischnodactylus bisbifasciatus sp. nov. Tafel 2, Fig. 7.

Auch diese Art ist dem *I. unifasciatus* recht ähnlich, ebenso der vorigen, aber sicherlich artlich verschieden durch folgende Merkmale:

Flügeldecken mit je zwei Binden, die vordere ist so breit wie die dunkle Basis vor ihr, im dritten und fünften Zwischenraum nach vorn und hinten etwas verbreitert, sie lässt die beiden ersten und die beiden äussersten Zwischenräume frei, die hintere, ungezackte, vor der Spitze, geht nach vorn und aussen etwas schräg und reicht auch auf den zweiten Zwischenraum. Die Hörner des Männchens sind gerade, kurz, und verflacht, unter ihnen befindet sich kein Längsfältchen. Die Unterseite ist in diesem Geschlecht auf dem Pro- und Mesosternum leicht und nicht deutlich punktiert.

Länge, 4.9 bis 6 Millimeter; Breite, 2.5 bis 3.1.

Ein Pärchen im Museum Berlin.

Formosa, Fuhosho, Juli, 1909 (*Sauter*).

Ischnodactylus pictipennis sp. nov. Tafel 2, Fig. 8.

Oval, Hinterkörper verhältnismässig stark gewölbt, Oberseite glänzend schwarz, oder bei mehr unreifen Stücken braun, Flügeldecken mit je zwei gelben Binden.

Der Kopf ist beim Männchen ungehörnt, das Epistom nicht vorgezogen, sondern mehr wie bei *Platydema* gebildet. Die Stirn ist beim Männchen der Länge nach kräftig eingedrückt, die Augen treten nahe zusammen, der Zwischenraum vorn ist beim Männchen ungefähr halb so gross wie das dritte Fühlerglied lang, beim Weibchen etwas grösser, hart am Auge liegt ein kräftiger Quereindruck. Der Vorderkopf ist kurz, viel kürzer als bei den meisten andern Arten, das Epistom ist gerade abgestutzt, die Ecken sind deutlich und liegen vor der Mitte der Augen. Der Clypeus ist querüber sanft gewölbt, aber der Rand ist nicht aufgebogen, ein Zähnchen vorn fehlt. Vor den Augen findet sich ein kräftiger Eindruck, die Länge des Clypeus ist etwas grösser als der Augenabstand vorn. Beim Weibchen findet sich nur ein leichter Eindruck auf der Stirn. Die Punktierung ist zwar fein, aber sehr deutlich. Die langen Fühler überragen beim Weibchen etwas, beim Männchen stark die Hinterecken des Pronotums, Glied 3 ist viel länger als 4, dieses ist noch doppelt so lang wie dick, 5 und 6 sind etwas dreieckig,

länger als dick, 7 so breit an der Spitze wie lang, 8 etwas quer, 9 stärker, 10 ist fast doppelt so breit wie lang, 11 nicht länger als breit. Beim Weibchen ist Glied 4 höchstens 1.5 mal so lang wie dick, 5 etwas quer, die folgenden werden immer stärker quer, sind aber nicht dreieckig sondern verrundet. Das Männchen hat auf dem Kinn hinten eine tiefe, rundliche Grube, die mit dichtem Haarpinsel versehen ist, beim Weibchen ist diese Grube sehr flach, auf dem Grunde vollkommen eben, sie randet hinten die Seiten und die Basis, ist über halbkreisförmig und vorn meist schlecht begrenzt.

Der Halsschild ist sehr flach, auch an den Seiten, 2.5 mal so breit wie lang, beim Männchen in der Mitte am breitesten, von dort nach hinten geradlinig schwach, aber deutlich verengt, nach vorn stark, beim Weibchen in der Endhälfte parallelseitig, die Hinterecken sind scharf rechtwinklig. Der Vorderrand ist, von oben gesehen, schwach ausgeschnitten, ganz leicht doppelbuchtig, da die Mitte sehr schwach vorgezogen ist, die Randung dort ist vollständig. Ausser den basalen Grübchen finden sich keine weiteren Eindrücke, die Punktierung ist sehr deutlich, ziemlich dicht.

Die Flügeldecken sind viel stärker gewölbt als der Halsschild, aber viel schwächer als bei den meisten Arten von *Platydema*. Es sind zwei Binden vorhanden: die vordere liegt vor der Mitte, ist sehr schmal, gezackt, sie lässt den Seitenrand schmal und den ganzen Nahtstreif frei, sie sendet im dritten Zwischenraum einen längeren, im siebenten einen kürzeren Ast nach vorn und im fünften nach hinten. Die hintere Binde ist nicht quer, sondern vom Seitenrand, wo sie sehr breit ist, schräg nach innen und vorn gerichtet, lässt ebenfalls den Nahtstreif frei. Von den beiden Binden hinten wird ein beiden Decken gemeinsamer, ungefähr kreisförmiger Raum eingeschlossen. Die Punktreihen sind sehr fein, ihre Punkte stehen dicht, der dritte Raum ist weiter vorn, der fünfte weiter hinten auf der vorderen Binde wesentlich breiter als die andern. Alle Zwischenräume, auch die der Seiten sind ganz eben, sehr fein, aber deutlich punktiert.

Die Unterseite ist in beiden Geschlechtern nackt, das Prosternum nach vorn sehr schwach gesenkt, zwischen den Hüften oft längsgefurcht. An den Hintertarsen ist Glied 1, an der Sohle gemessen, so lang wie der Rest, von oben gesehen deutlich kürzer.

Länge, 8 bis 10 Millimeter; Breite, 4.5 bis 5.

Malacca, Perak (*Jachau*, ferner *Grubauer*). Sumatra, Soekaranda (*Dohrn*); Deli, Ober Langkat (*Ude*).

In den Sammlungen Stettin, Berlin, München, und Gebien.

In der Zeichnung weicht unsere Art von allen andern ab. Sie bildet wegen des Kopfbaues eine gewisse Ausnahme in der Gattung; es fehlen die den meisten Arten charakteristischen Hörner des Männchens, ferner ist das Epistom weder vorgezogen noch aufgebogen. In der Zeichnung erinnert sie etwas an *I. bisbifasciatus,* aber die auch aussen ganz flachen Zwischenräume, die sehr lange, stark gezackte, schmale vordere und die eigentümliche Form der hinteren Binde unterscheiden beide Arten leicht. Hörner fehlen auch bei *I. sexguttatus,* der aber in Zeichnung und Skulptur ganz abweichend ist, ferner bei *quadrioculatus,* der beim Männchen ein vorgezogenes und aufgebogenes Epistom hat.

Genus **HOPLOCEPHALA** Castelnau und Brülle

Hoplocephala CASTELNAU und BRÜLLE, Ann. Sc. Natur. (1829) 338.[2]

Diese Gattung ist mehrfach und recht ausführlich beschrieben, aber fast immer nur von Faunisten welche nur die wenigen Arten einer Fauna vor sich hatten. Die besten Beschreibungen sind aufgebaut auf die eine europäische Art *H. haemorrhoidalis.* Diese ist in der Tat durch gute Merkmale von der nahe verwandten Gattung *Platydema* getrennt. Die meisten Autoren aber scheinen alle mehr oder minder zylindrisch gebaute Diaperinen in unsere Gattung gestellt zu haben. So sind die Gattungscharaktere sehr verwischt. In der Tat sind die Merkmale leider recht schwankend. Da aber unsere Fauna sehr arm an *Hoplocephala*-Arten ist, kann es hier nicht meine Aufgabe sein den Inhalt der ganzen Gattung kritisch zu beleuchten; das muss späterer Arbeit vorbehalten bleiben. Von allen asiatischen Arten die als *Hoplocephala* beschrieben wurden, ist mir nur eine bekannt geworden, *H. ferruginea* Motschulsky (nec Lec.)=*orientalis* Gebien, und ich stellte fest dass sie zu der Gattung *Platydema* zu stellen ist, trotz ihres zylindrischen Körpers. Da es leider schon ein *Platydema ferrugineum* Chevrolat gibt, muss abermals eine Umtaufe stattfinden. Es ist also zu zitieren: *Platydema ferrugineum* Motschulsky, India Oriental, syn. *orientale* Gebien; *Platydema biimpressum* Chevrolat, Amerika Central, syn. *ferrugineum* Chevrolat.

Von den übrigen asiatischen Arten scheint nur *H. asiatica* Lewis wirklich zur Gattung zu gehören, die der europäischen Art *H. haemorrhoidalis* aufs nächste verwandt ist. Von den andern Arten die Motschulsky in die Gattung stellt gehört vielleicht nicht eine einzige hinein. Wegen der sehr geringen

[2] Weitere Litteraturangaben siehe Gebien, Col. Cat. pars 28.

Grösse würde ich versuchen die Arten als *Pentaphyllus* zu deuten, wenn der Autor nicht bei allen von gestreift punktierten Flügeldecken spräche, ein Charakter der *Pentaphyllus* nicht zukommt.

Hoplocephala tricornis sp. nov. Tafel 2, Fig. 9.

Ziemlich gross, zylindrisch, glänzend braun, Seiten der Flügeldecken und der Halsschild heller, Fühler und Beine gelbrot.

Der Kopf des Männchens ist auffällig gebildet, er ist hinten sehr tief ausgehöhlt, die Höhlung hinten scharfkantig begrenzt, die Kante in der Mitte leicht vorgezogen, die hintere Wand der Höhlung ist sehr hoch senkrecht, der Grund ist spiegelglatt. Der Vorderkopf ist ungefähr halbkreisförmig, doch ist das Epistom fast gerade. In der Mitte des Clypeus findet sich ein kräftiges, aber kurzes, rundes Hörnchen, das sehr dick und etwas konisch, aber nicht spitz ist. Innen, direkt am Auge, findet sich je ein starkes, nach aussen über das Auge gebogenes, rundes Horn das nackt ist, seine Aussenkante geht gerade auf das Auge, die Innenkante bildet nahe dem Grunde eine Ecke und ist darunter, nach der Grube zu, wieder eingezogen. Bei dem schwächer entwickelten Männchen sind die Hörner kurz, bilden mehr starke Tuberkeln, die Grube ist nicht so tief, hinten nicht scharfkantig begrenzt und deutlich punktiert. Die Fühler sind schlank, Glied 3 ist länger als 4, von diesem an sind die Glieder erweitert, locker aneinander gesetzt, das vierte ist so breit wie lang, die vorletzten sind ungefähr 1.5 mal so breit wie lang. Die Wangen sind etwas schmäler als die Augen, der Hals ist sehr dick, das Mentum ist gewölbt; die Augen sind vom Maxillarausschnitt durch einen ziemlich breiten, blanken Zwischenraum getrennt. Das Endglied der Maxillarpalpen ist breit zylindrisch, an der Spitze schräg abgeschnitten, die Seiten sind allerdings kurz parallel.

Der Halsschild hat stark gerundete Seiten, die senkrecht abfallen, der Vorderrand ist seicht ausgeschnitten, die Basis in der Mitte mit feinem, aufgebogenen Rand, aber nicht mit Randlinie versehen. Die basalen Grübchen sind flach, die Ecken breit verrundet, besonders die hinteren.

Die Flügeldecken sind zylindrisch, ihre Seiten senkrecht, die Randkante ist von oben gerade überdeckt. Die ersten Punktstreifen, besonders der Nahtstreif, sind vertieft, hauptsächlich hinten, die Zwischenräume sind leicht gewölbt, ausserordentlich fein und dicht punktiert, hinten verbindet sich Streifen 3 mit 8 oder nähert sich ihm stark.

Die Unterseite ist braun, das Prosternum zwischen den Hüften schmal, hinten niedergedrückt und dann mit Fortsatz versehen, der kurz ist aber senkrecht abfällt. Das Mesosternum its V-förmig ausgeschnitten, der Abdominalfortsatz ziemlich schmal. Das Abdomen ist blank, kräftig und nicht eng punktiert. Die Schienen sind gerade, aussen mit scharf krenulierter Kante versehen. An den Hintertarsen ist Glied 1 etwas länger als 2 und 3 zusammen.

Länge, 6 Millimeter; Breite, 2.8.

Zwei Männchen im Museum Leyden, von denen mir eines für meine Sammlung überlassen wurde.

Nordöstliches Sumatra, Serdang, Tandjong Morawa (*Hagen*).

Ich habe lange geschwankt ob ich diese Art zu *Hoplocephala* oder zu *Platydema* stellen sollte; sie bildet einen Uebergang zwischen beiden. Mit der ersteren Gattung stimmt sie überein in der zylindrischen Gestalt, dem fast walzenförmigen Endglied der Maxillarpalpen, der fein gerandeten (das heist, aufgebogenen) Halsschildbasis, dem niedergedrückten Prosternum. An *Platydema* gemahnen das V-förmig ausgeschnittene Mesosternum und die gekerbt-gekielten Schienen.

Genus **MARTIANUS** Fairmaire

Martianus FAIRMAIRE, Ann. Soc. Ent. Belg. 37 (1893) 540.
Tenebriomimus KOLBE, Allg. Zeitschr. Entom. 6 (1901) 342.

Diese Gattung wurde von Fairmaire auf eine Art von den Comoren gegründet; als zweite Art stellte er den *Histeropsis dermestoides* Chevrolat von Indo-China und den Viti Inseln hinein. Den Typus der Gattung, *Martianus castaneus*, habe ich jetzt in Anzahl von den Comoren vor mir gehabt. Mit dieser Art fallen *Tenebriomimus adansoniarum* Kolbe und *Hoplocephala longula* Gebien, beide von Ostafrika, zusammen.

Ueber die systematische Stellung der Arten hat mehrfach Zweifel geherrscht. Chevrolat stellt seine Art *dermestoides* in die Untergattung *Histeropsis* von *Platydema*, also zu den Diaperiden. Ueber seine Auffassung der Art wird noch weiter unten die Rede sein. Fairmaire stellt, 1893, dieselbe Art fraglich zu *Alphitobius*, also zu den Ulomiden. Aber in demselben Jahre stellt er seine Gattung *Martianus*, in die er doch auch *dermestoides* bringt, trotzdem er die Aehnlichkeit mit *Alphitobius* betont, neben *Hoplocephala* zu den Diaperiden. Später bringt Chatanay sie wieder zu den Ulomiden. Ich selbst habe die afrikanische Art, die ich jetzt für identisch halte mit *M. castaneus*,

als *Hoplocephala* beschrieben. Aber an anderer Stelle habe ich *Martianus dermestoides* zu den Ulomiden gestellt. Man sieht, die Sache ist nicht leicht zu entscheiden. Habituell steht die Gattung dem *Alphitobius* sehr nahe. Aber ich halte als das entscheidende Kriterium die Schienbildung für ausschlaggebend. *Martianus* hat, wie die meisten Diaperinen, fein krenulierte, das heist, mit gekerbtem Kiel versehene Schienen, ein Merkmal das wir bei Ulomiden nicht finden. Ueberdies ist auch der Fühlerbau ganz wie bei *Platydema,* da die Glieder vom vierten respektiv fünften an erweitert sind, ohne eine Keule zu bilden.

Ich habe in einer früheren Arbeit [3] ausgeführt dass unmöglich *Histeropsis dermestoides* Chevrolat von den Viti Inseln und *Alphitobius* (?) *dermestoides* Fairmaire von Indo-China auf die gleiche Art bezogen werden können. Chevrolat's Art ist 10 Millimeter lang, das Männchen ist gehörnt; Fairmaire's Art dagegen ist 6 Millimeter lang und das Männchen ungehörnt. Ausserdem stammt die erstere von den Viti Inseln, die andere aus Asien, sind also geographisch weit getrennt. Der Widerspruch wäre nicht zu klären, wenn wir nicht mit Chevrolat's oft bewiesener Nachlässigkeit rechnen würden. Ich glaube die Grössenangabe ist falsch (10.5 : 2.5 Millimeter), denn das würde auf ein ausserordentlich langgestrecktes Tier deuten, ungefähr von der Gestalt eines *Hypophloeus,* während der Verfasser in der Beschreibung doch ausdrücklich das Tier "elongato-oblongus" nennt, und das passt auf die Grösse 6 : 2.5 Millimeter. Ueberdies liegen mir aus der ehemaligen Sammlung Haag die Typen von den Viti Inseln vor, die mit Fairmaire's Deutung übereinstimmen. Unerklärlich aber ist mir, wie der Autor die Art gekörnt nennen kann. Von den circa 100 Tieren die ich untersuchte, ist nicht eines gekörnt. Möglicherweise hat der Autor ein Artefakt vor sich gehabt, das er für das Männchen hält, oder aber das Männchen einer ganz andern Art mit *dermestoides* vermengt.

Die Unterschiede zwischen *Martianus* und den verwandten Gattungen sind in der Tabelle auseinandergesetzt.

Martianus dermestoides Chevrolat.

Martianus dermestoides CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 242; FAIRMAIRE, Ann. Soc. Ent. Fr. (1893) 28; GEBIEN, Saraw. Mus. Journ. 2 (1914) 33.

Diese Art ist in Süd China, dem indo-malayischen und papuanischen Gebiet weit verbreitet und scheint häufig zu sein. Sie ist

[3] Bull. Saraw. Mus. 2 (1914) 33, 34.

an dem gestreckten Körper, der an einen lang gezogenen *Alphitobius* erinnert, an der braunen oder schwarzbraunen Oberseite, den grossen Augen, den vom vierten Gliede an erweiterten Fühlern zu erkennen. Das Mesosternum ist ausgeschnitten, doch sind die Ecken verrundet, das erste Glied der Hintertarsen ist verlängert, das Endglied der Maxillarpalpen fast zylindrisch.

Indo-China, Saigon, Pnom Penh. Süd China, Provinz Fokien. Java Occidental, Soekaboemi, 2,000 Fuss (*Fruhstorfer*). Banguey bei Borneo. Aru-Inseln (*Beccari*). Deutsch Neu-Guinea. Viti Inseln.

In den Sammlungen Dahlem, Hamburg, Gebien, über 100 Exemplare. Wahrscheinlich in allen Sammlungen, aber für Ulomiden gehalten.

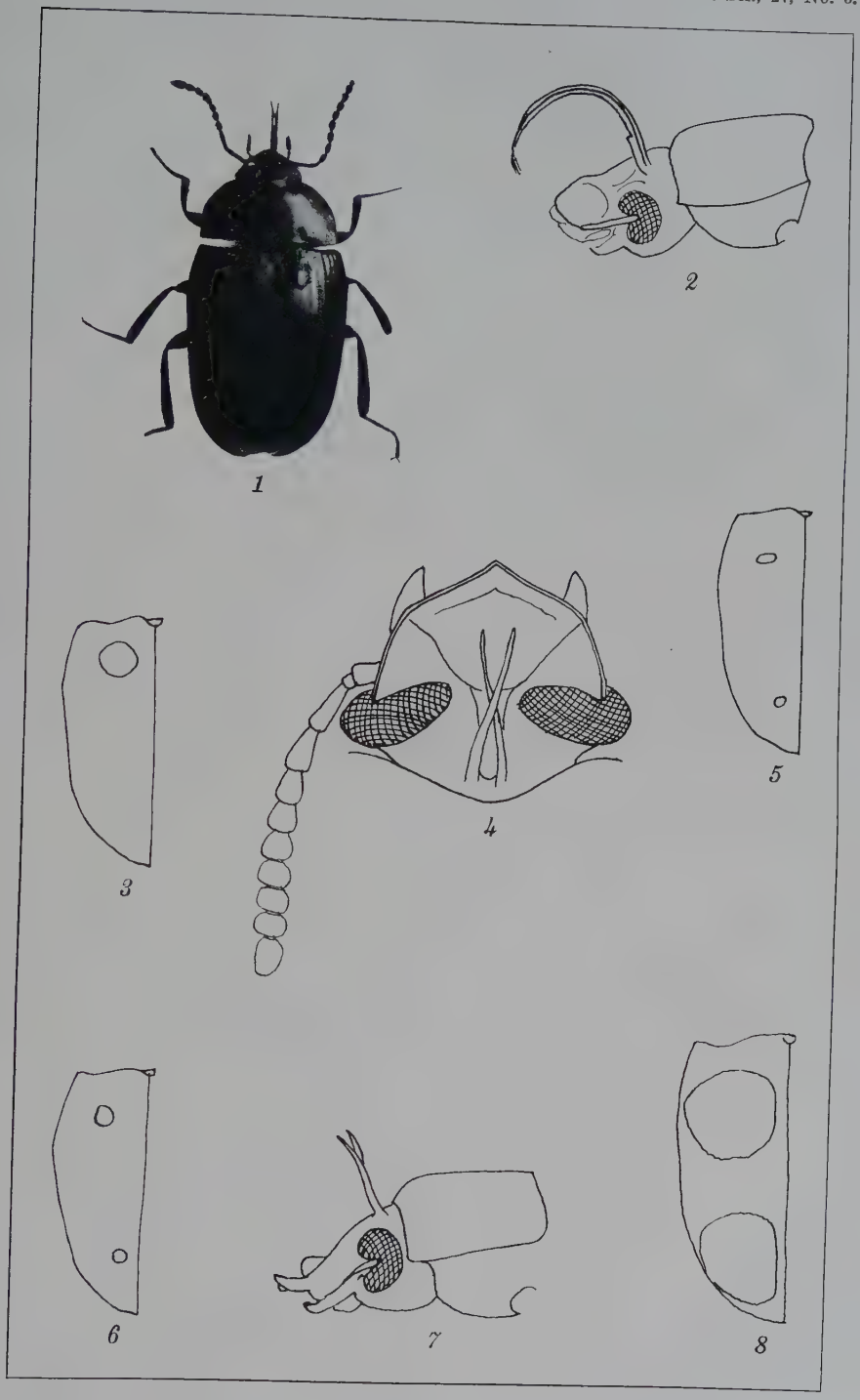
ILLUSTRATIONEN

Tafel 1

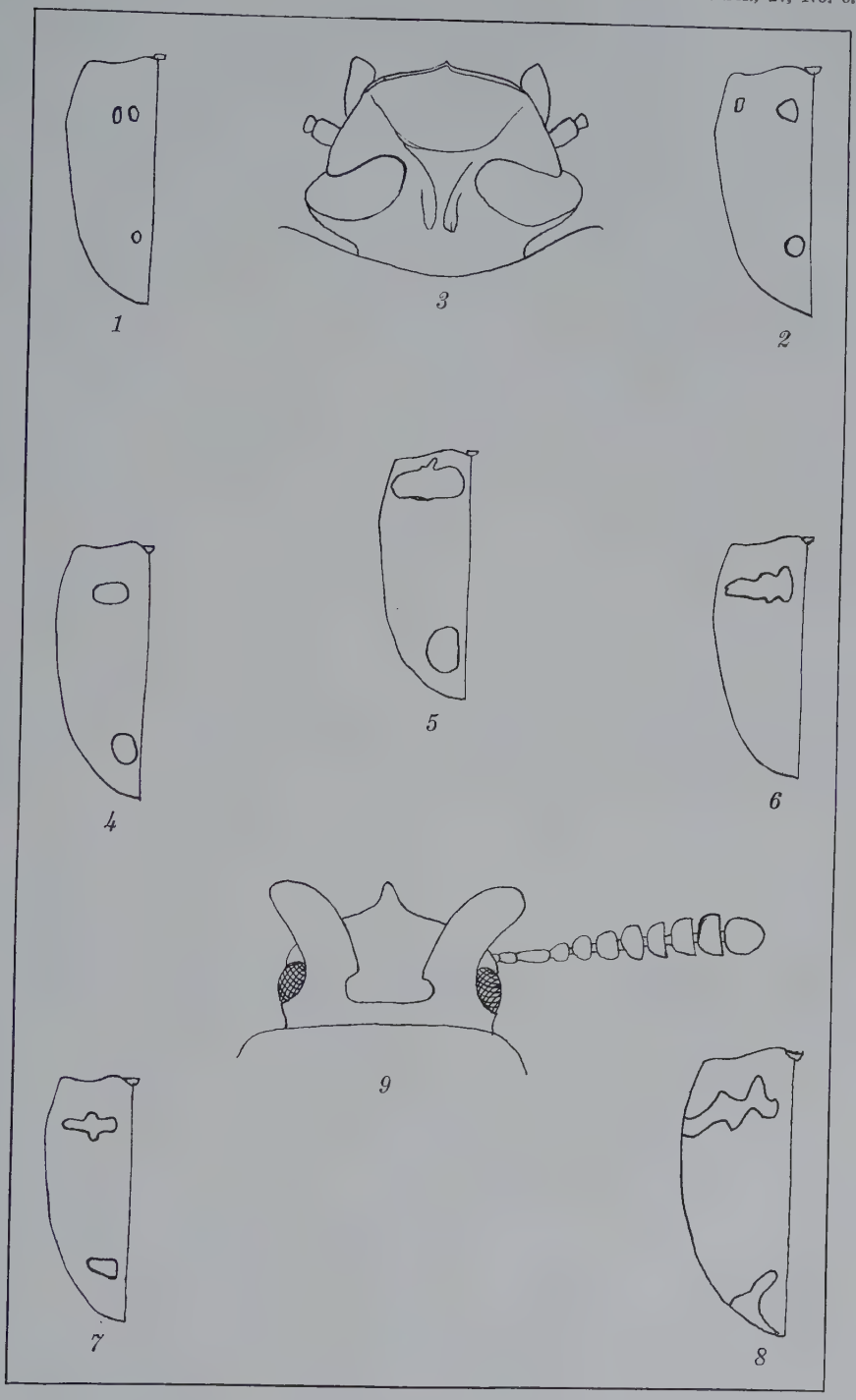
Fig. 1. *Ischnodactylus colon* sp. nov.
2. *Ischnodactylus colon* sp. nov. Kopf.
3. *Ischnodactylus rubromarginatus* Chevrolat. Deckenzeichnung.
4. *Ischnodactylus mirabilis* Gebien. Kopf.
5. *Ischnodactylus mirabilis* Gebien. Deckenzeichnung.
6. *Ischnodactylus batesi* Chevrolat. Deckenzeichnung.
7. *Ischnodactylus nasutus* sp. nov. Kopf.
8. *Ischnodactylus fenestratus* sp. nov. Deckenzeichnung.

Tafel 2

Fig. 1. *Ischnodactylus sexguttatus* sp. nov. Deckenzeichnung.
2. *Ischnodactylus bisetiger* sp. nov. Deckenzeichnung.
3. *Ischnodactylus quadrioculatus* Chevrolat. Kopf des Männchens.
4. *Ischnodactylus quadrioculatus* Chevrolat. Deckenzeichnung.
5. *Ischnodactylus sumbawicus* sp. nov. Deckenzeichnung.
6. *Ischnodactylus unifasciatus* sp. nov. Deckenzeichnung.
7. *Ischnodactylus bisbifasciatus* sp. nov. Deckenzeichnung.
8. *Ischnodactylus pictipennis* sp. nov. Deckenzeichnung.
9. *Hoplocephala tricornis* sp. nov. Kopf eines wohlentwickelten Männchens.



TAFEL 1.



TAFEL 2.

THE PHILIPPINE
JOURNAL OF SCIENCE

VOL. 27 AUGUST, 1925 No. 4

THE DISTURBANCES OF CUTANEOUS SENSIBILITY IN LEPROSY [1]

By JOSE N. RODRIGUEZ

Acting Chief Physician, Culion Leper Colony, Philippine Health Service

ONE TEXT FIGURE

INTRODUCTION

In a paper read before the first Leprosy Conference held at Berlin in 1897, Jeanselme [2] deplored the fact that, in spite of the importance of anæsthesia in the diagnosis of leprosy, this symptom had not received the attention it merited in the study of the disease. To-day, after a lapse of a quarter of a century, this remark of the French savant still holds good. In spite of the advances in the knowledge of leprosy brought about by a better understanding of the pathology and bacteriology of the disease as claimed by Macleod,[3] the excellent monographs of Jeanselme and Lie [4] still form the groundwork of our knowledge on this subject and they are still extensively quoted.

The investigations of Head and Rivers [5] have thrown new light on the study of the cutaneous senses. After section of

[1] Published with the approval of the Director of Health and upon recommendation of the Philippine Leprosy Research Board.

[2] Des troubles Sensitifs dans la lépre, Lepra Conferenz, Berlin 3 (1897) 384.

[3] A brief survey of the present state of our knowledge of the bacteriology and pathological anatomy of leprosy, Brit. Journ. Dermatol. 21 (1909) 309.

[4] Lepra maculo-anæsthetica und Lepra anæsthetica, Lepra 5 (1904) 78. Lepra in Rückenmark und den peripheren Nerven (1904), cited by Macleod.

[5] Brain (1908) 323, cited by W. H. Howell, Text book of Physiology, 6th ed., W. B. Saunders Co., Philadelphia (1918) 278.

the cutaneous nerves, these workers studied the return of the various elements of sensibility—touch, tactile discrimination, heat, cold, and pain—following the union of the cut ends. They observed that there are essentially two sets of sensory fibers which, after section and reunion of the nerves, regenerate at different times. One group, the protopathic, conveying sensations of pain and extreme changes of temperature, regenerate earlier than the second or epicritic set, which can be stimulated by small differences of temperature, ranging between 26° C. and 37° C., and by light pressure. Moreover, they demonstrated the presence of sensory fibers in the muscular branches which respond to appropriate stimuli even after the skin has been rendered completely anæsthetic by section of the cutaneous nerves. On the basis of these findings they proposed a new classification of sensory nerve fibers as follows:

Cutaneous sensory fibers:
- Epicritic—
  - Heat, small differences.
  - Cold, small differences.
  - Touch, light pressure.
  - Tactile discrimination.
- Protopathic—
  - Heat, extremes.
  - Cold, extremes.
  - Pain.

Subcutaneous or deep sensory fibers:
- Pressure.
- Pain.
- Muscular, position.

Nonsensory afferent fibers:
- From muscles, joints, etc., ending in cerebellum.

So far as I am aware, Hopkins[6] is the only worker to consider the disturbances of sensation in leprosy in the light of this classification.

LITERATURE

Before presenting my own observations, it is desirable to survey briefly the current views in regard to the etiology of the sensory disturbances in leprosy. In spite of the extensive literature on the subject of nerve leprosy, there is no unanimity of opinion regarding even the most important points beyond the fact that the nerves may be affected anywhere along their

[6] Early manifestations of leprosy, New Orleans Med. & Surg. Journ. 70 (1917–1918) 56.

course—in the nerve endings, in the peripheral branches, or in the nerve trunks. Nonne [7] says: "The nerves pay to the lepra bacillus the same tribute as do the other tissues of the body." The nerve fibers undergo a severe parenchymatous and interstitial involvement, with periarteritic and endarteritic changes of the nerve arterioles. Lepra bacilli have been found in the connective tissue elements of the epineurium, the perineurium, and the endoneurium, lying free in the lymph spaces or in fixed tissue cells and plasma cells. They have also been seen in the nerve fibers themselves located in the neurolemma and in the sheath of Schwann, but they have never been found within the axis cylinder. The bacilli are often seen singly and in rows, seldom in clumps. An interesting finding is the considerable number of regenerating fibers and the relatively frequent finding of the axis cylinder still persisting after the destruction of the medullary sheath.

The way in which the nervous system is invaded, and the character of the changes in the spinal cord (if any exist), variously attributed to leprosy, remain to be definitely established.

The relation of the cutaneous macules to the nerve lesion is also an unsettled question. A great deal of attention has been paid these macules. They are often, though by no means regularly, seen early in cases of nerve leprosy; when present they are manifestly closely related to the nerve changes, "in the nature of a persistent inflammatory process of the type of erythema perstans,"[8] a belief supported mainly by many of the older workers though shared also by a number of present-day leprologists. The opposite view is held by many authorities who are of the opinion that the macules, known as "neurolepprides" among the French, are caused by the actual presence of the lepra bacillus in situ, at some time or other, and that they are but "microscopic images" of the ordinary lesions of skin leprosy, differing from these only in that the extension is inward into the subcutaneous layer and in that there is no marked formation of new tissue.

Due to this difference of opinion, the presence or absence of the lepra bacillus in these macular patches is a subject of much interest. While many workers have failed to find the organism in the neurolepride several, notably Looft,[9] Babes,[10] and Kling-

[7] Lehre von der Lepra anaesthetica, Lepra 5 (1904) 22.
[8] Brit. Journ. Dermatol. 21 (1909) 309.
[9] Virchow's Archiv. (1892) 128, cited by Nonne.
[10] Lepra Conferenz 1 (1897) 155.

müller [11] succeeded in finding them. The bacilli were always very few, located principally in the endothelium of the capillaries. Macleod rightly questions whether a few lepra bacilli, which organisms cause comparatively little cellular reaction, can produce such skin lesions. Furthermore, there is the possibility that the organisms may be present only incidentally, having been deposited there secondarily from the blood stream, which is obviously more or less contaminated, as it were, in leprosy. On the other hand, Darier [12] doubts if a more or less mysterious modification of the nerve influx can produce a lesion with perivascular infiltration and cellular degeneration without the superimposed or concomitant presence of the bacilli.

Leloir [13] in 1886, and Unna [14] in 1894, came to the conclusion that these macules were of a neurological nature, caused by an involvement of the nerve trunks, because they found the trunks more involved than the smaller branches and because of the extensive atrophic changes which point to an involvement of the larger nerve trunks. Moreover, they also failed to find the lepra bacillus in these lesions. This opinion is shared, with some modifications, by Neisser,[15] by Arning,[16] and by Zambaco,[17] who likewise believe that the atrophy is not of peripheral origin. Virchow used to teach that the process begins in the trunks, followed by descending and ascending degeneration, according to the Wallerian law. Gerlach [18] and Dehio,[19] however, are not in agreement with the conception of Unna and Leloir. The former claims that the earliest and most advanced changes occur at the peripheral nerve endings, with a tendency to ascend. These two workers lay stress on the fact that no definite relation apparently exists between the sup-

[11] Lepra 3 (1903) 145.

[12] Recherches sur les taches erythèmato-pigmentées de la lépre, Lepra Conferenz, Berlin 3 (1897) 396.

[13] Traite practique et theorique de la lépre (1886), cited by Nonne.

[14] Histopathologie der Hautkrankheiten (1894), cited by Nonne.

[15] Vierteljahresschrift für Dermatologie (1883).

[16] Eine eigentümliche Veränderung an den grösseren Nervenstammen bei einzelnen Fällen von Lepra, Verhandl. des VI. deutschen Dermatologen-Kongresses.

[17] Des rapports qui existent entre la maladie de Morvan, etc., et la lépre, Lepra Conferenz, Berlin 1 (1897) 21.

[18] Untersuchungen über die Unabhängigkeit der Bildung anästhetischer Flecke von der Erkränkung zugehöriger Nerven bei der Lepra anaesthetica. Inaug. Diss., Dorpat (1890), cited by Nonne.

[19] Ueber die Lepra anaesthetica und den pathogenetischen Zusammenhang der Krankheitserscheinungen, Lepra Conferenz, Berlin 1 (1897) 85.

posedly involved nerve trunks and the areas of anæsthesia. For these reasons, Gerlach and Dehio believe that the process begins at the peripheral nerves rather than at the trunks. Gerlach, after making serial sections of the nerves from the brachial plexus to the nerve endings in the affected skin in a case of pure nerve leprosy, found that the peripheral nerve fibers invariably showed the most-advanced lesions. He believes that the process originally begins as a round-cell infiltration around the sweat glands. The nerve endings are secondarily invaded and destroyed.

The simple scheme shown in fig. 1 illustrates the hypothesis of Gerlach and Dehio.

According to this hypothesis, the process starts as an infiltration of the skin, *sl*, which becomes anæsthetic owing to involvement of the sensory-nerve endings. Then follows an ascending nerve-fiber degeneration, beginning in the affected skin area along the peripheral cutaneous branch, *a*. When it has extended to *b*, a mixed branch from which a motor branch *c* is given off, the muscle supplied by this branch is affected. Later, when the degeneration reaches a point in a nerve trunk indicated at *d* the function of the mixed branch *e* is affected and, through its terminal cutaneous branch *f* and motor branch *g*, the skin and muscle supplied at a greater or less distance from the site of the first lesion, *sl*, will also exhibit nervous disturbances. In this manner there is a gradual extension of the affection.

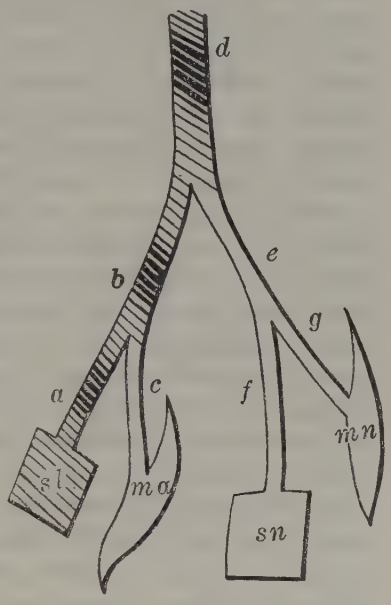


FIG. 1. Schema illustrating the Gerlach-Dehio hypothesis (from Dehio); *a*, diseased sensory-nerve branch; *b*, diseased mixed nerve; *c*, not involved muscular branch with muscle, *ma*: *d*, mixed-nerve trunk; *e*, mixed nerve; *f*, cutaneous branch to skin, *sn*; *g*, muscular branch with muscle, *mn*; *sl*, leprotic skin; *sn*, skin; *mn*, muscle.

Gerlach also noticed, independent of this degeneration, inflammatory proliferations involving the entire nerve trunk, localized almost wholly at certain well-known points of predilection, as along the ulnar nerve above the elbow where the trunk is exposed to external injury. At such places the motor

fibers are also degenerated, if the infiltration has advanced far enough.

The finding of lepra bacilli in the macules and the work of Woit [20] tend to confirm the greater part of the findings of Gerlach. Woit followed the nerves step by step from the periphery toward the center, and found constantly that the skin branches were entirely degenerated in these cases, although he did not find any specific leprotic changes in the nerves. In places exposed to traumatism he found fresh inflammation, principally of the fibrous elements, in the entire cross section of the nerve trunk, producing a degeneration of the sensory nerves; but, contrary to the findings of Gerlach, the motor fibers were very slightly involved or not at all. Under skin areas that were deeply anæsthetic he found the muscle bundles still intact.

Babes, Klingmüller, and Jeanselme helped to strengthen the theory of peripheral involvement of the nerves. Jeanselme found some of the nerve endings so sclerosed and changed to solid fibrous tissue that he could hardly recognize the residuum. Klingmüller believes that an embolic process of the small vessels under the skin initiates the process, the surrounding tissue including the nerve endings being secondarily affected with gradual, ascending involvement of the larger branches.

The objections to the theory of primary peripheral involvement are many and serious. The following are some of the most important that have been raised: (*a*) This theory cannot be applied to the many cases in which there are no macules or in which these appear only after marked nervous manifestations are already present; (*b*) it does not explain why, although macular lesions are often seen in the trunk, this region is usually free from nervous manifestations; (*c*) neither does it explain the frequently more or less symmetrical arrangement of the anæsthesia, the macules being irregular in shape; and (*d*) the atrophy of the deep tissues, including the bones, in advanced cases can hardly be attributed to the degeneration of the peripheral nerve alone, and points to a central disturbance.

In advanced cases with anæsthetic involvement of entire extremities, sometimes more or less symmetrically, this theory falls short, for these changes suggest either a segmentary involvement of the posterior gray matter, especially in cases with dissociation of the sensations similar to syringomyelia or

[20] Das Rückenmark, die peripheren Nerven und die Hautflecken bei der Lepra maculo-anaesthetica, Lepra 1 (1900) 179.

disease of the posterior roots, or possibly even a functional disturbance. However, it would seem that nothing definite in the spinal cord and the posterior roots is to be found to account for these manifestations. It is true that Babes reported the discovery of the organisms in the spinal ganglion cells and in the ganglion cells of the anterior horn, and Kalindero found them in the intervertebral ganglia nine times in twenty-two autopsies; but, on the other hand, Danielssen and Boeck failed to find characteristic lesions in the spinal cord, and many others have failed to find leprosy bacilli in the cord, even in advanced cases.

Using the Weigert-Pal stain, Babes [21] found evidence of degeneration of the fibers in the column of Goll, in the cervical portion. Woit [22] described a slight rarefaction of the fibers in the columns of Goll and Burdach in the cervical and thoracic cords, but these findings were not constant. In the blood vessels he found endothelial nuclear proliferation and diffuse thickening of the walls, all of which can be found in chronic diseases, and especially in cachexia. In the ganglion cells of the anterior and posterior horns, Woit saw slight changes of degeneration, as described by Babes, Kalindero,[23] and Looft. According to Woit, von Strumpel and Fr. Schultz, two authorities on diseases of the spinal cord, using material from their own cases as well as from those of Woit, failed to find changes in the spinal cord or in the spinal ganglia different from those seen in cachexia or secondarily following involvement of the roots.

From this incomplete survey it would seem that, in the absence of any regularly occurring lesion in the spinal cord, which should be decidedly marked in advanced cases, the central structures can practically be eliminated from consideration. The question is, then, whether the disturbance arises from a lesion of the trunk, including the smaller subdivisions, or whether it develops as a result of cutaneous involvement, which, because of some determining influence, affects the nerves as an ascending involvement instead of developing the familiar lesions of ordinary cutaneous leprosy.

While the evidence advanced by several authorities in favor of the primary peripheral involvement cannot be ignored, there

[21] Lepra Conferenz 1 (1897) 155.

[22] Das Rückenmark, die peripheren Nerven und die Hautflecken bei der Lepra maculo-anaesthethica, Lepra 1 (1900) 179.

[23] Lepra Conferenz 3 (1897) 357.

are too many commonly observed clinical features that are not explainable by this hypothesis to permit its acceptance as the only method by which neural lesions develop. It is not seen why it may not be that both processes occur in different cases.

PRESENT STUDY

The present paper, based on 800 neurological examinations on 200 cases of all types and stages of leprosy, is limited exclusively to a study of the troubles of cutaneous sensibility, particularly the anæsthesia, which characterize this disease.

I believe that the anæsthesia superimposed on the skin lesions should be distinguished from the nervous disturbances independent of the cutaneous manifestations, the "anesthésie névretique" of the French. These two types will be discussed separately.

The various phases of the sensory disturbances were studied and special attention was paid to the changes in such disturbances observed from time to time in a group of cases that were being treated with the ethyl esters of chaulmoogra oil. Such examinations, along lines suggested by the work of Head and Rivers, in correlation with other, more-usual examinations, are believed to be of importance in determining the actual degree of improvement taking place in cases under treatment.

A brief description of the method followed in making these examinations will not be out of place at this juncture.

METHOD OF EXAMINATION

In investigating the cutaneous anæsthesia of leprosy no expensive, complicated apparatus is necessary. The success of the examination depends more on the care and thoroughness with which it is done than on the elaborateness of the instruments used.

The patient should be undressed so far as possible, though undue exposure and roughness which would tend to make him—or, more particularly, her—restless or ill at ease should be avoided. The examiner should also make it a point never to hurry the patient and should make due allowances for his intelligence and mental capacity. At least two examinations are necessary, and they should preferably be made on different days. Very often among our patients a third or a fourth examination must be made, because the disturbances are often found at the second examination to have changed considerably, in both extent and quality.

To examine the temperature sense two small test tubes and a supply of warm and cold water are all that is actually necessary. Ordinarily only the protopathic sensibility need be tested, and for this purpose the temperature of the warm water may be anywhere between 40° and 60° C., and that of the cold water, between 10° and 15° C. Temperatures higher than 60° C. are not only unnecessary, but are likely to cause some injury. If it is desired to test the epicritic temperature sense, the temperature of the water must be accurately determined. It should be not more than 37° C. for the warm tube, and not less than 26° C. for the cold. In our work two basins of water were kept at the proper temperature by adding small quantities of ice water or hot water as needed, and the tubes were filled from these at very frequent intervals.

For light touch, a light camel's-hair brush or a wisp of cotton should be used. Some use the head of a pin for this purpose, but such procedure cannot be recommended as it requires care not to apply more pressure than is necessary or desirable. It is a good plan to make the patient, whose eyes should be kept closed or covered, count every time he feels the touch. Tactile discrimination is best determined with a von Frey's æsthesiometer, but an ordinary light carpenter's compass with somewhat blunted points and a scale with accurate millimeter markings will do as well. The threshold stimulus is determined with a baræsthesiometer, of which Eulenburg's is a type; but for ordinary examinations, the determination of the threshold stimulus is not essential.

In testing for the pain sense, an ordinary sharp needle is all that is necessary. The patient must be carefully instructed to distinguish between pain and pressure, as very often he claims that the prick is painful when all that he feels is mere contact or pressure. It is well to observe the facial expression or any reflex movement of the patient after a prick; in dull patients this may be the only indication available to the examiner.

ANÆSTHESIA IN THE CUTANEOUS LESION

Duhring,[24] Gaucher,[25] and Broque,[26] among others, hold that there is always present in the skin lesions of leprosy some de-

[24] Cited by de Buermann.
[25] Traite des Maladies de la peau, 2: 468, cited by de Buermann.
[26] Traite 1 (1917) 519.

gree of sensory disturbance. However, many others, notably de Buermann and Gougerot,[27] failed to find the anæsthesia in a certain number of cases, and therefore proved that this statement does not hold true in all cases.

In order to present more clearly the character of the nervous changes over the cutaneous lesions the different types of these skin manifestations will be discussed separately. Of the principal lesions, we distinguish three distinct types; namely, the infiltration, the nodule, and the macule. What is designated as infiltration consists of more or less diffused thickening of the cutaneous tissue which appears glistening, reddish, dark brown or coppery in color, and often hairless. The thickening may be slight or marked; often, particularly when marked, an exaggeration of the skin folds is produced.

Nodules are firm, fairly well circumscribed growths ranging in size from a rice grain to a walnut, usually appearing late in the disease. They are divided clinically into two types, cutaneous and subcutaneous. Nodules of the latter type are deep; and the skin, which is movable over them, at least primarily, shows no discoloration or special change. Those of the common type are more superficial, the localized thickening taking place in the dermis itself; frequently fine vascular arborizations can be seen through the thin stretched epidermis.

Macules are typically found in neural or mixed leprosy. In color they range from light brown, hardly discernible on the skin of a Filipino, to pale yellowish white. These macules are usually negative on ordinary bacteriological examination. In some cases macules that are in general similar to these have slightly raised, sometimes pinkish borders; the central portion may be of the same color as the rest of the macule, or it may be darker, or it may have a pinkish tint. Such lesions are evidently active and the finding of bacilli is to be expected.

Infiltration.—In forty-four selected cases with infiltrations that were examined, the lesions were located principally on the face and extremities. They ranged in duration from two months to thirteen years. Seven of these cases, or about 16 per cent, showed no sensory changes whatever over the lesions; in four of these seven duration was between three and four years and in three, from one to two years. A group of nineteen others of similar duration (one to four years) showed changes of sensi-

[27] Lepra 9 (1909) 55.

bility over the lesions, from which it is seen that the existence of the nervous changes does not depend entirely on the duration of the infiltration.

In twenty-two of the cases with infiltrations, half of the total, the sensation of light touch was unaffected while the sensibility to pain and temperature was impaired or absent. Thus the dissociation of sensibility, as described by Jeanselme in his cases of cutaneous leprosy, is evident in this group. Hyperæsthesia near or around the older infiltrations was not observed.

Nodules.—The firm nodules appear as a rule in rather advanced stages of the disease. They are often located on the face, at the lips, nose, and ear lobes, and especially on the extremities. As anæsthetic changes in the extremities are usually more or less extensive in such cases, it is often impossible to distinguish the nervous changes over the nodules from the general anæsthesia of the surrounding skin. In only six of thirty-two cases showing this particular variety of skin lesions were the nodules surrounded by nonanæsthetic skin. All six showed sensory impairment over the lesions; the remaining sensibility was identical in character with that mediated by the protopathic fibers.

Macules.—Thirty cases with macules, varying in duration from three months to ten years, were studied. In seven of these lepra bacilli were found in one or more patches. Of the twenty-three bacteriologically negative cases all but two showed disturbances of temperature, pain, and light touch sense; in 30 per cent there was complete loss of sensibility. The bacillus-positive macules were most interesting from the neurological viewpoint. In five of the seven hyperæsthesia was present in some portion of the macule, usually along the border or at some segment or portion of the periphery. In spite of the hyperæsthesia, however, the sense of tactile discrimination was distinctly impaired in all the cases. In the other two positive cases no hyperæsthesia was found; in these the organisms were very few. Therefore, the presence of hyperæsthesia in some part of the macule or any portion of the surrounding skin seems to indicate that the lesion is active and progressing; as a rule, it is positive for the lepra bacillus.

The results of these examinations show that in the case of the macules the earliest changes consist of the involvement of the epicritic fibers, together with those mediating pain of the protopathic set. An interesting finding in some of the macules

is the presence of the so-called paradoxical cold reaction. The sudden application of a test tube heated to 60° C. produces a sensation of cold. Head and Rivers consider this reaction characteristic of the sensibility mediated by the protopathic fibers, present only when the epicritic system has been destroyed.

In two of the bacteriologically negative cases the macules were very faint, pale brown, and hardly distinguishable from the surrounding skin. In these the cutaneous sensibility was normal.

To summarize, the macules positive for *Bacillus lepræ* were the only cutaneous lesions found in this series that showed hyperæsthesia. Ninety-three per cent of the skin lesions of this type showed disturbances of sensibility. The epicritic system is apparently involved first and there is no dissociation present. The skin over the nodules was found to be anæsthetic, or partly so. Sixteen per cent of the infiltrations showed no sensory disturbances.

ANÆSTHESIA INDEPENDENT OF CUTANEOUS LESIONS (ANESTHÉSIE NÉVRETIQUE)

Sixty-eight lepers presenting this type of anæsthesia were studied, and monthly observations were made on the changes occurring over a period of more than a year. Forty-three were males and twenty-five females; they ranged in age from 8 to 66 years, and the duration of the anæsthesia was from one month to sixteen years.

Distribution and development.—The most frequently involved portions of the body are the extremities. The distribution of the anæsthesia in the sixty-eight cases examined is shown in the following table:

TABLE 1.—*Distribution of anæsthesia.*

	Cases.
Legs	62
Dorsum, feet	58
Forearm	58
Dorsum, hands	49
Fingers	43
Thighs	42
Arms	37
Palms, hands	28
Buttocks	24
Lumbar region	11
Scapular and interscapular regions	9
Neck	7
Face	6
Abdomen	4
Scalp	4

It is seen that the legs, feet, and forearms showed the most-frequent as also the earliest involvement, with very little difference; the neck, face, scalp, and abdomen were relatively seldom involved.

Although the anæsthesia is, as a rule, unilateral at the onset, sooner or later the corresponding area on the opposite member also shows nervous changes, and in some cases the arrangement is remarkably symmetrical. The significance of this distribution of the anæsthesia has been the subject of much discussion by leprologists. Some insist that it points to some lesion in the spinal cord, although there seem to be no adequate pathological grounds for this supposition. Those who are interested in the subject are referred to the extensive monographs of Jeanselme, Lie, Nonne, le Dantec,[28] Dijerine,[29] and the comparatively recent article by Cussec,[30] who took advantage of a trip from Marseilles to Dakar on the hospital ship *Flandre*, to examine some of the sixty Senegalese lepers who happened to be on board the vessel.

In the lower extremities the anæsthesia began, in the majority of our cases, at the lower portion of the tibial region, and spread downward over the feet, and laterally and upward. until the entire anterolateral portion of the leg was involved. In a considerable number the anæsthesia started at the outer third of the dorsum of the feet, extending upward, or a separate focus started at this region and fused with the spreading area from the legs.

At the posteromedial surface of the leg the extension is more gradual. From this stage the anæsthesia extends upward to involve the external surface of the thighs, spreading out in the form of a fan as it ascends. Sometimes the separate spots of anæsthesia appear at the lateral surface of the thighs and at the buttocks, and these fuse with the ascending anæsthesia. The upper limits rarely reach the inguinal fold; there remains usually an area of normal sensibility over the groins, which persists even in advanced cases. Posteriorly it seldom goes above the level of the iliac crests.

On the upper extremities the first lesions appear at the ulnar surface of the forearms at a variable distance from the wrist, sometimes as far up as the lower third of the arm. Or they may start at the external margin of the hands, involving at the very onset the small finger and soon afterward the ring

[28] Pieces de pathologie exotique (1911).
[29] Semeiologie nerveuse (1919), cited by Cussec.
[30] Archives de Médecine et Pharmacie Navales 111 (1921) 303–312.

finger. From these points the anæsthesia spreads upward, the arms being involved first on the extensor surfaces. The axillary space is not involved.

In three cases of advanced mixed leprosy of over fifteen years duration the anæsthesia was practically generalized, the only sensitive portions of the body being the axillary and inguinal regions, the cubital spaces, part of the scalp, the lower portion of the abdomen, and a narrow strip with skin along the spine and over the sternum.

The changes of cutaneous sensibility on the external generative organs of eighty-four male patients, about 85 per cent of whom have leprosy of the mixed type, were also studied; no observations were made on females.

In forty-five of these men, 53 per cent, no anæsthesia was found; in twelve, or 14 per cent, there was thermo-anæsthesia and analgesia at the scrotum alone; and in the rest, twenty-seven, or 32 per cent, the prepuce and scrotum together presented such changes.

In making such examination, it is important to bear in mind that the glans penis possesses only protopathic sensibility. I have heard of workers describing cases of mixed leprosy in which the sensory changes, consisting of partial anæsthesia, were found at the glans only. It seems very likely that there was no anæsthesia at all in these patients.

Naturally the enjoyment of the sexual act was said to be markedly diminished in the majority of the cases having anæsthesia over the external genitals. However, a few claimed an almost undiminished enjoyment in spite of the presence of practically complete anæsthesia of the penis and scrotum; several of these were still productive.

CHARACTER OF THE SENSORY DISTURBANCES

The anæsthesia of leprosy is variable in quality and extent, not only in different patients presenting similar degrees of advancement, but also in the same patient. The character and extent may even change from day to day. Jeanselme divides the anæsthetic area into two distinct zones; a fixed inner area, probably produced by material lesions in the nerves involved; and a more-mobile and unstable outer fringe based on a simple functional trouble of the cutaneous sensations. Although this arrangement of the anæsthesia was not found in all our patients, it was present in a considerable percentage of the cases.

This border-line fringe is of interest because, after attempts at treatment, perhaps through the influence of suggestion, this area is reduced to a minimum and an improvement may be assumed when actually no permanent benefit has been produced. It is certain that the psychic factor plays an important rôle in influencing the extent or even the character of the anæsthesia and, in order to define its true limits, repeated examination is necessary in most cases. One is often at a loss how to evaluate or interpret modifications or changes observed.

The disturbances of the various elements of cutaneous sensibility will be taken up separately.

Temperature.—Of the cutaneous senses, the earliest to be involved is that of temperature. In 85 per cent of the sixty-eight cases examined for "anesthésie névretique" it showed the most-extensive and the most-marked disturbance. It is also the most variable and the most unstable. As a general rule, the heat perception is affected earlier than the cold. In the more-advanced cases, the difference in extent between the areas showing epicritic impairment of the temperature sense and those showing disturbance of the protopathic system is not often remarkable. Complete loss of the temperature sense is the rule in advanced cases, so that a burn severe enough to cause a blister is not perceived by the patient. In this way blisters and bullæ may frequently be found, especially at the ankles, legs, hands, forearms, and feet, which may be taken as some trophic manifestation of the disease itself.

The heat and cold spots were also investigated at the border of the anæsthetic areas. The spots were found to become less numerous as we examined toward the anæsthetic portion. In some areas only few of such spots remained, separated by skin devoid of any temperature sensibility.

Pain.—Next to temperature, the pain sense is the earliest and the most extensively affected. In the older cases the loss is so complete that a pin prick gives the sensation of mere pressure. At the borders of the completely analgesic areas a deep prick will give the sensation of pain, but the sensation is delayed. The fact that sensation of pain, though mediated by protopathic fibers, is lost early in leprosy shows that the involvement of the peripheral nerves does not follow the ordinary epicritic-protopathic sequence observed in simple section of the nerves. Instead, an imperfect dissociation of the cutaneous senses is effected. This finding suggests a lesion in the cord

or the presence of some selective affinity by the morbid processes for certain nerve fibers; namely, those for pain and temperature.

Light touch.—This is lost comparatively late and often is the least extensive. In unfavorable cases, taking a rapid course, the area of absent or impaired light touch extends rapidly, sometimes outgrowing the area of analgesia. In cases responding favorably to treatment the sensation of light touch returns somewhat more rapidly than do the others. It would seem that the fibers conveying the sense of light touch are not ordinarily as deeply involved as those mediating the other cutaneous senses.

Tactile discrimination.—If the affected area is compared with a healthy portion of the skin near by, or on the opposite side, the dissimilarity is seldom marked, the usual difference being from 3 to 5 millimeters. Sometimes there is impairment of tactile discrimination, indicated by the æsthesiometer, although the sense of light touch is still intact.

Subcutaneous sensibility.—The sensation of pressure, pain, and muscular position are often retained, even in the late stages. In deeply anæsthetic areas the application of a hot body, or a piece of ice, or a pin prick, will cause a sensation of simple pressure due to stimulation of the deep sensory fibers. The sensation of pain is lost much earlier than the other two.

Although the initial site of the anæsthesia does not correspond with any particular nerve distribution, it is usually located within the area supplied by certain cutaneous nerves. In the upper extremities, for example, the anæsthesia usually starts within the area supplied by the ulnar and the median cutaneous nerves, and on the legs within the distribution of the sural and the superficial peroneal. In children it is very common to see the initial patch within the area supplied by the last thoracic and the first lumbar spinal nerves, but this is very unusual in older persons.

Hyperæsthesia.—Hyperæsthetic and paræsthetic symptoms are frequently noticed at the onset of the disease, though they may reappear at any stage of the malady. The most-frequent complaint noticed was numbness; this was reported by 71 per cent of those who felt paræsthetic symptoms at the prodromal stage. The numbness is invariably limited to the extremities, sometimes felt only on one side, but usually bilateral. This numb sensation is most marked toward the latter part of the day, or at night before bedtime. Oftentimes it is accompanied

by tingling or prickling, usually at night, when the affected limb may also feel peculiarly weak and heavy.

Prickling as if with many needles, without numbness, had been noticed by nine patients, and unexplained weakness without any other symptoms, by five. Two complained of sensation of cold, originating at the tips of the fingers and coursing toward the elbows. Three had tearing and stabbing pains along the legs or arms, sometimes so severe that they "became almost crazy with the pain," as one of them expressed it. Two others felt vague pains along the legs on walking, another two had cramps, one had rheumatoid pains, and five suffered from persistent itching which was not relieved by scratching. The paræsthetic symptoms may precede the initial lesions by a period of several months, or they may develop at the same time as or shortly after the appearance of the skin manifestations.

At irregular intervals during the course of a case of nerve or mixed leprosy, the patient may suffer from acute accesses of neuralgic pains of varying intensity. In some instances these attacks accompany the phenomenon known as "lepra fever." The pain is sometimes very severe, persisting for days, during which time the patient may suffer immeasurable anguish, and sleep is impossible.

The paroxysms are accompanied by exquisite hyperæsthesia of the affected parts, though the sensations of light touch and tactile discrimination remain impaired. Following the neuritic paroxysm, or an attack of lepra fever, the anæsthesia is often found to have extended. In many instances, however, it eventually tends to recede and may become less extensive than previously, or may even disappear completely without treatment.

With sudden changes in the weather, some lepers complain of persistent pain in the soles of the feet and along the extremities, accompanied by severe chills, although there is no rise of temperature. In those cases, the autonomic and general nervous systems seem to be on the very verge of disorganization.

Perversion of the cutaneous senses.—This is found with frequency at the margin of the anæsthetic areas. The sensation of light touch may show the phenomenon of "sommation," [31] which is said to be present if an area previously not sensible to touch is repeatedly touched with a fine camel's-hair brush or a wisp of cotton, and the sensation reappears after some

[31] See Cussec, Archives de Médecine et Pharmacie Navales 111 (1921) 303–312.

time. In two cases the patients invariably pointed about 4 centimeters below the point touched. As to the temperature sense, the application of a hot test tube may give rise to a sensation of cold, or vice versa. A retardation of the sensation is also observed in leprosy, though not so frequent or marked as in the atrophic type of beriberi.

EFFECT OF ETHYL ESTER TREATMENT ON THE ANÆSTHESIA

The sensory changes observed in thirty-six cases of mixed leprosy receiving ethyl esters of chaulmoogra oil regularly for a period of six months, in average doses of 7 cubic centimeters a week, were compared with the improvement noticed in the cutaneous lesions. The data obtained are given in Table 2.

TABLE 2.—*Effect of ethyl ester treatment on the cutaneous lesions and on the anæsthesia.*

Type of lesion.	Moderately improved.		Slightly improved.		Total improved.	
	Cases.	*Per cent.*	*Cases.*	*Per cent.*	*Cases.*	*Per cent.*
Cutaneous (nodular, infiltrations, macules)	6	16.6	16	44.4	22	61
Anæsthesia:						
Tactile anæsthesia	3	8.3	12	33.3	15	41.6
Analgesia	0	0	14	38.8	14	38.8
Thermoanæsthesia	3	8.3	7	19.4	10	27.7
Total	6	5.5	33	30.5	39	36.1

Type of lesion.	Stationary.		Worse.	
	Cases.	*Per cent.*	*Cases.*	*Per cent.*
Cutaneous (nodular, infiltrations, macules)	12	33.3	2	5.5
Anæsthesia:				
Tactile anæsthesia	14	38.8	7	19.4
Analgesia	14	38.8	8	22.2
Thermoanæsthesia	14	38.8	12	33.3
Total	42	38.8	27	25.0

The skin manifestations became moderately improved in six cases, or 16.6 per cent; slightly improved in sixteen, or 44.4 per cent; they remained stationary in twelve, or 33.3 per cent; and in only two did they become slightly worse.

As regards the anæsthesia, only 5.5 per cent were moderately improved; 30.5 per cent were slightly improved; 36.1 per cent remained stationary; and 25 per cent were found to have become worse. Of the different elements of cutaneous sensibility, the tactile sense showed the greatest total improvement, 41.6

per cent, followed by the pain and temperature senses in the order named.

The undoubted benefit of the treatment was also demonstrated in a few cases which had to be dropped during the course of the experiment, due to complications. In three of these the joint and neuritic pains, which had disappeared during the entire period of treatment, were again felt as soon as the injections were discontinued.

To summarize, it may be said that the ethyl ester treatment improves the anæsthesia, although this improvement is not as marked as and is brought about more slowly than the changes in the cutaneous lesions. The sensibility of light touch, pain, and temperature are improved in the reverse order in which they become involved.

DIAGNOSIS

Anæsthesia plays an important rôle in the diagnosis of leprosy, particularly in the neural or maculo-anæsthetic type, in which the bacilli are seldom found. In some instances the presence or absence of sensory disturbances may be the determining factor in arriving at a clinical diagnosis.

The following are important points in the diagnosis of leprosy:

Paræsthesia.—This symptom was observed in the prodromal stage in 50 per cent of my cases. I have seen in the dispensary of the Philippine General Hospital three lepers (who are now in Culion) whose condition was diagnosed as the rudimentary form of beriberi, and who were treated for that condition for months. One was admitted to the medical ward, and another was referred to the physical department for galvano-faradic treament; but in neither case was the true nature of the affection even suspected, until they finally developed frank cutaneous manifestations of leprosy.

Anæsthesia.—Anæsthesia, particularly to pain and temperature, is a very early sign of leprosy. Its usual location, extent, mode of progress, and character have already been fully described.

Thickening of the superficial nerve trunks.—Even in the earliest stages, one or both ulnar nerves are frequently thickened, oftentimes irregularly. Occasionally, the great auricular and superficial peroneal nerves are also thickened and palpable.

Depigmentation (macules).—This may be noticed either prior or subsequent to the nervous symptoms; it is commonly observed

in cases of early leprosy among Culion children.[32] Pale patches or macules are also found in syphilis and certain skin diseases such as tinea versicolor, commonly seen among Filipinos. Usually, however, the macular lesions of leprosy have a wider distribution, are less scaly, and present more regular borders than does tinea. In some instances it may be impossible to distinguish between the two, both *Bacillus lepræ* and the fungus *Microsporon furfur* being found in the same area. The presence of anæsthesia and the absence of sweat after the pilocarpin test reveal the leprotic character of the lesion.

Localized erythematous patches or infiltrations.—These are sometimes the first cutaneous manifestation of the disease.

Painless enlargement of the superficial lymphatic glands.—Such enlargement, particularly of the inguinal, epitrochlear, axillary, and cervical glands, is a suspicious sign.

"Parchment" skin (parakeratosis).—This is characteristic of nerve leprosy, often seen on the anterior and lateral aspects of the legs.

Atrophies and contractures.—As a rule, the small and ring fingers contract first in leprosy. These contractures are accompanied by a slow but progressive atrophy of the lumbricals and other short muscles of the hands.

Trophic ulcers.—Trophic ulcers should be especially searched for.

Ulceration of the nasal septum.—This is not infrequently seen, even early, at the onset of the disease.

Knee jerks.—The knee jerks should not be forgotten. Even with marked neural involvement, the knee jerks often remain unchanged. In a few cases, this symptom may be diminished or entirely abolished.

It need hardly be said that thorough bacteriological examination should be made in every suspicious case.

DIFFERENTIAL DIAGNOSIS

Discussion of the differential diagnosis will be limited in this paper to consideration of the diseases that may present symptoms simulating the neural manifestations of leprosy; namely, anæsthesia and trophic changes. These will be taken up separately.

[32] Gomez, L., J. Avellana Basa, and C. Nicolas, Early lesions and the development and incidence of leprosy in children of lepers, Philip. Journ. Sci. 21 (1922) 233.

ANÆSTHESIA

Beriberi.—An early case of nerve leprosy can easily be confused with beriberi, unless the possibility of the former disease is borne in mind in all cases presenting symptoms of anæsthesia and paræsthesia. Unfortunately, such error prevents the prompt segregation and treatment of the patient, to the detriment of himself and the public.

The difference between the nerve symptoms of the two diseases can be better appreciated if it is kept in mind that in leprosy the muscular fibers in the affected nerves are not as deeply involved as are the sensory fibers, whereas in beriberi the reverse is the case, and signs of muscular paralysis appear early. Even in advanced lepers with distortion and absorption of the fingers, the grasp is still retained and the knee jerk is only diminished and may even be exaggerated. Furthermore, in leprosy the development of these changes is very slow, whereas in beriberi it is comparatively rapid.

As for the character of the anæsthesia itself, there are certain distinctive features which more or less characterize each disease. The anæsthesia in beriberi is never as complete as in leprosy. Retardation of sensation is a characteristic feature of beriberi; I have found it in all the cases I have examined so far. As long as five seconds may elapse from the time a hot test tube is applied to the anæsthetic part before the patient feels the sensation. In leprosy retardation is only occasionally observed. The sense of light touch, in relation to the other cutaneous senses, is involved much earlier in beriberi than in leprosy, so that there is no dissociation, the epicritic fibers being involved first.

In distribution, the anæsthesia is likely to be patchy at the onset in both diseases, and the same degree of symmetry may later be found in both. In beriberi, however, the anæsthesia is more likely to start at the radial half of the dorsum of the hands, whereas in leprosy the ulnar portion is more likely to be involved. A ring of anæsthesia around the mouth, without paralysis, is indicative of beriberi, for in leprosy it occurs only in very long-standing cases with paralysis of the orbicularis oris muscle.

Syringomyelia.—Late in the last century, particularly during the period between the International Congress of Dermatology and Syphilology held in Vienna in 1892 and the First Lepra

Conference at Berlin in 1897, the similarity between syringomyelia and leprosy was the subject of much discussion among the leading leprologists of Europe. Some, notably Zambaco Pasha, maintained that the two diseases were identical. Later Zambaco modified his views and came to consider syringomyelia, as well as such diseases as scleroderma, Morvan's disease, sclerodactylia, Reynaud's disease, ainhum, and the progressive muscular atrophy of Aran-Duchenne, as attenuated or aberrant forms of leprosy which manifest themselves in those countries where the conditions do not favor its proper development. He compared these diseases to the pure hereditary manifestations of syphilis. This view has not gained general acceptance, principally because the bacillus of Hansen has never been found in those conditions.

Syringomyelia is now regarded, according to Osler,[33] as a "gliosis, a development of embryonal neurogliar tissue in which hemorrhage or degeneration takes place with formation of cavities." So far as I am aware, this condition has never been reported in the Philippines.

The following are the distinguishing features between the two diseases:

In favor of syringomyelia:
- The complete dissociation of the cutaneous senses.
- Integrity of the superficial muscles of the face.
- Absence of discolorations on the skin.
- Nonenlargement of the ulnar nerves or the lymphatic glands.
- Integrity of the hair.
- Deviation of the vertebral column.
- Absence of *Bacillus lepræ*.

In favor of leprosy:
- Presence of discolorations or infiltrations on the skin.
- Enlargement of the ulnar, peroneal, or the great auricular nerves, and of the superficial lymphatic glands.
- Loss of hair over affected parts.
- Spontaneous absorption of the fingers and toes.
- Atrophy and paresis of the superficial muscles of the face.
- Presence of *Bacillus lepræ*.

Morvan's disease is a type of syringomyelia with pronounced trophic disturbances, characterized by cutaneous anæsthesia, neuralgic pains, and the formation of painless destructive whit-

[33] The Principles and Practice of Medicine, 8th ed. D. Appleton & Co., New York (1917) 964.

lows. Such whitlows are sometimes seen in cases of cutaneous or mixed leprosy.

Neuritis.—Of the various kinds of neuritis that need be considered, the most important is alcoholic neuritis. The distribution of the anæsthetic areas may simulate that of leprosy. The diagnosis is based on the history and the presence of the characteristic general tremulousness in chronic alcoholism. Arsenical neuritis can be eliminated by the presence of diarrhœa and abdominal pain, and lead paralysis by colic and the blue lines on the gums.

Sometimes anæsthesia of functional origin may be found in hysteria. The anæsthesia usually involves half of the body and it may be transferred to the other side by suggestion.

There are many cases seen in hospital and private practice in the Tropics that cannot be grouped under beriberi or under any of the more commonly recognized cases of specific etiology. It is my belief that many of these are probably cases of early leprosy, most of which may be expected to develop frank manifestation of the disease.

CONTRACTURES

Yaws.—Cases of tertiary yaws have repeatedly been diagnosed as leprosy and brought to the Culion Leper Colony because of the ulcerations and marked deformities that are sometimes seen late in this disease. These mutilations are produced by necroses and ulcers, involving the bones, which on healing produce marked deformity of the parts affected. As a result the fingers may be contracted or bent at various angles, the legs may become shortened and twisted, and the face may be disfigured by permanent changes in its bony structure, particularly the nose and the forehead. The pleomorphic skin lesions of yaws and syphilis may be mistaken for leprosy, but the history and the usual absence of nervous manifestations over the lesions, together with the laboratory examination, render the diagnosis fairly easy.

Aran-Duchenne.—The disease known as the Aran-Duchenne type of progressive muscular atrophy is characterized by a contraction of the flexor muscles of the hand and extreme atrophy of the thumb muscles, the interossei, and the lumbricals, producing the characteristic claw hand (main-en-griffe), the counterpart of which is commonly seen in leprosy. The absence of anæsthesia and absorption of bones, the fibrillary contractions,

the absence of trophic ulcers, and the characteristic electrical reaction in this disease should make the differentiation not difficult.

Ainhum.—This disease is characterized by linear strangulation and ultimate spontaneous amputation of one or more toes or fingers. It is frequently confined to the toes, usually the small toe, the process taking many years to develop and not progressing beyond this stage. It has been found only among negroes in Africa.

SUMMARY

Though studies have been made on the anæsthesia of leprosy, particularly by the older writers, the manner of its development is not satisfactorily established, and its nature has not been studied in the light of modern knowledge of nerve function.

The work of Head and Rivers offers a new basis for the study of this disturbance. These workers, after studying the loss of sensation following the section of cutaneous nerves, have proposed a new classification of the cutaneous senses, based on the order in which they return after the cut ends are united. They also distinguish between the cutaneous sensibility of the skin proper and the deep or subcutaneous sensibility which is conveyed by sensory fibers contained in the muscular branches. The true cutaneous sensations are mediated by two systems of fibers which regenerate at different times when the cut ends are reunited; namely, a set conveying sensations of extreme changes of temperature and pain which regenerate early, in which the sensibility is low and imperfectly localized, and which is known as protopathic sensibility; the other system, regenerating later than the protopathic, mediates the senses of light touch, tactile discrimination, and small differences of temperature. This classification was, so far as I am aware, first applied in leprosy by Hopkins, but his results are not conclusive.

The cutaneous sensibility of two hundred cases of all types and stages of leprosy have been examined repeatedly with the view to studying the nature and the behavior of the anæsthesia under various conditions. The nervous changes were found to be most variable and fickle in many of the cases, sometimes even varying from day to day in the same individual.

Anæsthesia in the cutaneous lesions was examined separately from that in skin free from skin eruptions. In 16 per cent of all the infiltrations examined, there were no sensory changes whatever over the skin lesions. This is contrary to the general

idea that anæsthesia is invariably present in the cutaneous lesions. Over the rest (84 per cent) of the infiltrated areas dissociation of the cutaneous senses was present. The hard nodules, which generally appear late in the disease, were usually surrounded by anæsthetic skin. In the case of the macules the anæsthesia was complete in 30 per cent of the total number of thirty cases. The remaining sensibility in the rest belongs to the protopathic type of Head and Rivers; there was no dissociation. In macules positive for *Bacillus lepræ,* there was hyperæsthesia at the borders.

In the anæsthesia independent of the skin lesions the senses of temperature and pain were the earliest and the most intensively involved. The sensation of light touch and tactile discrimination were affected comparatively late, so that a dissociation of the syringomyelic type is suggested.

The legs, dorsum of the feet, forearms, hands, and fingers, in the order named, are the most-frequent sites of the anæsthesia. As a rule, the anæsthesia is at first unilateral but, sooner or later, a more or less symmetrical arrangement is effected in the majority of the cases.

During or after an attack of lepra fever or a paroxysm of neuralgic pains, the anæsthesia may show surprising changes; the areas may extend rapidly, or there may be a rearrangement or transformation of the senses of touch, pain, and temperature. After the disappearance of the acute symptoms, the anæsthetic areas may retain their new borders, they may return to their former limits, they may recede to a smaller area than the original, or they may disappear.

The differentiation of the anæsthesia in beriberi from the nervous changes of leprosy is not always easy. In the former disease the process is much more acute and the anæsthesia is never as complete and seldom as extensive as in leprosy and is early accompanied by signs of motor involvement, such as absent knee jerk or the presence of wrist or foot drop. The retardation of sensibility is another characteristic feature of the anæsthesia in beriberi; it is rarely present in leprosy. If in a case of nerve or mixed leprosy signs of rapid muscular weakness develop with loss of the knee jerk, and rapid development of wrist or foot drop, dry beriberi is to be strongly suspected. In some cases, the voice may suddenly become aphonic and high-pitched. Wet beriberi is less difficult to distinguish.

In thirty-six cases of mixed leprosy under ethyl ester treatment, the anæsthesia was found to have improved in 36 per cent, although the improvement is not as marked as in the skin

lesions. Of the cutaneous senses, that of light touch showed the highest percentage of general improvement and, since it is also the last to be affected, it is probably the least involved.

CONCLUSIONS

1. Not all the cutaneous lesions of leprosy are anæsthetic. Sixteen per cent of infiltrations do not show any disturbance of the cutaneous senses.

2. The anæsthesia of leprosy is fickle and variable; several examinations are necessary to determine its real extent and character.

3. Distinction should be made between the sensory disturbances in the skin lesions and those independent of all cutaneous manifestations.

4. The character of the anæsthesia depends on whether it is located in a macule, an infiltration, or a skin free from lesions. In macules there is, as a rule, early loss of epicritic sensibility; in nodules and infiltrations the anæsthesia is very variable; and in a skin free from eruptions a partial dissociation of the syringomyelic type is effected. These differences suggest the possibility that the cutaneous nerves may be involved in various ways, depending on the character of the overlying skin lesion.

5. The anæsthesia shows definite improvement under ethyl ester treatment although, as is to be expected, it is not as well marked as the improvement in the cutaneous lesions.

6. In countries where leprosy is endemic, the possibility of this disease should always be considered in every case presenting symptoms of paræsthesia such as numbness, prickling, formication, etc.

7. Although the absence of anæsthesia does not exclude leprosy, the touchstone in doubtful cases, from the clinical standpoint, is its presence in some cutaneous lesion or in some skin area.

8. The final confirmation of the diagnosis is the presence of the specific organism in the lesions or on the nasal septum.

ILLUSTRATION

TEXT FIGURE

FIG. 1. Schema illustrating the Gerlach-Dehio hypothesis (from Dehio); *a*, diseased sensory-nerve branch; *b*, diseased mixed nerve; *c*, not involved muscular branch with muscle, *ma*; *d*, mixed-nerve trunk; *e*, mixed nerve; *f*, cutaneous branch to skin, *sn*; *g*, muscular branch with muscle, *mn*; *sl*, leprotic skin; *sn*, skin; *mn*, muscle.

A HOOKWORM CAMPAIGN IN CEBU

By C. MANALANG

Of the Philippine Health Service, Manila

Under direct supervision of Dr. Charles N. Leach, of the International Health Board, the Philippine Health Service began the hookworm campaign in Cebu Province in the latter part of November, 1922.

Cebu Province is the most thickly populated island in the Philippines, with a population of almost a million and an area of only 1,668 square miles. It is mountainous and rocky, and without forests. The towns are situated for the most part along the seacoast, and during rainy weather the rivers overflow their banks and flood the low-lying sections of the towns. As there are no sewers and the method of fæcal disposal is imperfect, soil pollution is extremely common in many places.

The town of Carcar was selected for the inauguration of the campaign, owing to the apparent prevalence of hookworm disease in this town, its size (population, 40,000), its prosperity, and its accessibility to the capital. The geographical location of Carcar, near the center of the island, recommended it as a center of operation.

With the coöperation of the municipal officials and the local health officer the campaign was made known to the public through the newpapers and by means of a *bandillo*.[1] This was done two or three times, a few days before the arrival of the survey party. Twenty-four hours before the party arrived the health officer prepared the building, scales, etc., and his sanitary inspector distributed 50 to 100 enamel sputum cups to a representative group of people. The cups were marked with the name, age, sex, and occupation of each person who received one. Stool samples were collected in these sputum cups. Those who desired treatment were instructed to eat no supper or breakfast, and to present themselves at the municipal building at 7 a. m. the following day. They were requested to bring with them bed chambers, bedding, and some light food, such as milk, bread, tea, etc. The party made it a rule to arrive in the town the

[1] A public proclamation read by a drummer at crowded places.

night before or very early in the morning of the day on which work was to start. The party consisted of a medical officer in charge and two laboratory technicians. On arrival in the town the municipal health officer and one or two sanitary inspectors were detailed to assist the party.

Each person who applied for treatment was weighed by the sanitary inspector, who wrote the name and the weight in kilograms on a slip of paper. The patient took the slip to the medical officer in charge, who examined him for organic lesions of the heart, for evidences of advanced cirrhosis of the liver, and for chronic alcoholism. Particular care was exercised to eliminate individuals from the treatment list who had partaken of alcohol within a few hours of presenting themselves for treatment. This could easily be elicited if the examiner looked for the characteristic face and odor from the mouth while he auscultated the heart.

The following instructions were carefully observed in connection with treatment:

Carbon tetrachloride in the treatment of intestinal parasites.

Contraindications.

1. Should not be given in cases of chronic or acute alcoholism.
2. Should not be given in cases of organic heart disease associated with lack of compensation.
3. Should not be given in cases of cirrhosis of the liver.

Method of administration.

1. The most favorable time for the administration of the treatment is in the early morning, the patient having omitted supper and breakfast.
2. First measure the dose (1 cubic centimeter for each 5.5 kilograms of body weight), using a glass cylinder graduated to 0.1 cubic centimeter.
3. Pour carbon tetrachloride into about 25 cubic centimeters of water and administer immediately to avoid loss by evaporation.
4. Patient should be required to lie down until after the bowels have moved.
5. If the bowels do not move within six hours after treatment a saline cathartic can be used. No purgation is necessary before treatment, and the drug has a cathartic effect which ordinarily obviates the necessity of a purge after treatment.
6. Food can be taken immediately after the first bowel movement following the treatment.
7. Work can be resumed by the patient as soon as any symptoms of dizziness, from which he may suffer, have disappeared.
8. Until further notice no carbon tetrachloride should be used other than that furnished by the Bureau of Health, which has been tested by the Bureau of Science.

At the beginning of the work, as a rule, one person presented himself for treatment the first day, many others watching the effect; but on the second day hundreds would take the drug, particularly if the trial case passed many ascarides. The campaign would never have attracted attention had it not been for the ascarides. Hookworms were not spectacular enough or else ascarides had been mistaken for hookworms.

While the treatment was being given the laboratory was set up in a conspicuous place and the microscopic index of the fifty or more specimens collected the day before was determined.

Two slides of fæcal smears were examined and when found negative for hookworm ova, 2 to 5 grams of the specimen were concentrated by the ether-centrifuge method (Cropper and Row).

The municipal officials, school teachers, and students were invited to examine the ova, the prepared slides of living larvæ, and the adult hookworms, and the life cycle of the worm was described. The mode of transmission, effects, and prevention were explained in detail by the medical officer in charge. Bulletin 26 of the Philippine Health Service, on Hookworm Disease, was distributed free. Special emphasis was laid on the proper disposal of excreta and the construction of latrines, particularly the "Antipolo System," which is a covered pit, the size of which depends on the number of users, provided with a hole for a conducting pipe made of either wood, clay, or sheet iron, and another hole for a ventilating pipe. The seat which rests on the conducting pipe is provided with a cover while the top of the vent is screened with wire cloth, thus, if properly maintained, being both mosquito and fly proof. This form of toilet is very cheap and unless washed by floods will not pollute the soil. In low places flooding can be prevented by raising the ground level around the pit above the highest level reached by the floods. The revetment of the rivers is under consideration in two large towns, but it will be some time before funds are available for this work. In the poor districts four or five homes were allowed to construct a common latrine. It was also explained to the people that by proper disposal of fæcal matter the incidence of other intestinal diseases would be reduced.

While this demonstration was going on, those treated were accumulating from two to five bowel movements each, and in the afternoon the contents of twenty or more bed chambers

were screened, in public, for the purpose of demonstration, for the collection of worms and their classification, and for determination of the intensity of the infection.

In the morning of the second day hundreds would take the treatment, the public school children having been invited to present themselves. The coöperation of the school authorities was important, as the school buildings were used for observation, as temporary hospitals, and for demonstration and lecture purposes. The influence of the school children was very far-reaching, as there is hardly a home which has not at least one child in the public school. In towns where there are private schools these also were invited to send their children for treatment and demonstration.

In the afternoon more fæces were screened, from those treated in the morning, if only a few were treated the day before; otherwise, another demonstration and talk were given to the teachers and students.

In the meantime the sanitary inspectors in the next town would be collecting material and getting ready for the arrival of the party. The continuation of the campaign was left in the hands of the local health officers who continued the administration of the drug and the campaign for better sewage disposal. When a health officer was in charge of two or three towns he assigned different days for treatment at each place.

The party stayed two days, as a rule, in each town. To determine the relative intensity of hookworm infection the "screen index" was used, as it could easily be completed on the first day of the campaign. A certain number of bowel movements taken at random were screened, and the number of individuals from whom adult hookworms had been taken was divided by the number of individuals examined, the result being the "screen index." When the "screen index" was compared with the microscopic index the intensity of infection could easily be determined. For example, in one place the microscopic index for hookworm was 65 per cent, while the screen index was 10. This shows that, although in that place 65 per cent of the people were infected, the infection was so light, or the number of adult worms so few, that in only 10 per cent were adult worms found by screening. This was due to the presence of a large quantity of undigested residue (corn and vegetables) in screened fæces, even after fasting, which hide the worms, particularly when not very numerous, even after careful washing and search.

On the other hand, another town gave a microscopic index of 83 per cent, and 82 per cent screen index. This shows that those examined harbored worms in sufficient number to be easily found by screening.

Table 1 shows this discrepancy between the microscopic and the screen indices.

TABLE 1.—*Discrepancies between microscopic and screen indices.*

Town.	Microscopic index.	Screen index.
	Per cent.	*Per cent.*
Carcar	77	76
Sibonga	83	80
Argao	42	10
Dalaguete	70	60
Oslob	68	10
Barili	83	82
Dumanjog	93	62
Badian	76	50
Moalbual	65	10

Besides the survey, mass treatment, and educational campaign, certain observations were made in the towns in which the party stayed longer than the usual period while waiting for a supply of tetrachloride.

In Carcar anæmia was so prevalent that a count of anæmics on three occasions gave an incidence of 40 to 45 per cent in three hundred individuals, gathered for treatment or as onlookers.

Local physicians reported malaria very rarely and only among the recent arrivals from Davao and other parts of Mindanao and from Mindoro. At no time was an enlarged spleen noted among the anæmics. Neither was there complaint from any of them of recent chill and fever.

The following data were collected from twenty anæmics:

Age: From 8 to 22 years; average, 14.
Sex: Males, 14; females, 6.
Occupation: All students except one.
Toilet: Ten with Antipolo and 10 with open toilets.
Footwear: All walked barefooted part of the time and all lived in low, often flooded areas.
Weight: Average weight, 31.5 kilograms.
Hæmoglobin (Tallquist): Average, 55 per cent.
Œdema: Fifty per cent had œdema of face, eyelids, or legs.

Subjective symptoms.—Seven suffered from *kabuhian*, a cramplike pain in the pit of the stomach described by the patient as a moving ball

and relieved by pressure on the part. The pain usually occurred when the stomach was empty; it occurred daily, weekly, or monthly. The attack was so severe at times as to induce fainting. After an attack the person was very weak for a day or so and unable to work, desiring to lie down most of the time.

Stool.—All these cases were positive for hookworm, most of them very heavily infected, particularly those suffering from kabuhian.

On thirteen individuals suffering from kabuhian, not in the above group, the following information was obtained:

Age: From 8 to 49 years; average, 23.
Sex: Males, 7; females, 6.
Occupation: Housekeepers, laborers, weavers, and students.
Toilet: Only 2 had Antipolo, the rest open toilets.
Hæmoglobin: Average, 55 per cent.
Œdema: Six with œdema of face or legs, or both.
Ground itch: Eleven had *pangagud*, the local name for ground itch.
Spleen: Not palpable in all.
Footwear: All went barefooted part of the time, their homes at times flooded, or they habitually walked barefooted in flooded areas.
Weight: Average, 42 kilograms.
Stool: All were heavily infected with hookworms.

From 9 anæmic cases the average worm count per person after treatment was 136. Counts were made on twenty-four-hour stools.

These data show that most of the anæmia in this locality was due to hookworm infection.

Hookworm disease was prevalent, as shown by seven of twenty anæmics who manifested typical subjective and objective symptoms.

Table 2 shows the microscopic improvement on forty-eight Carcar cases five to seven days after receiving one dose of carbon tetrachloride; eleven cases, or 23 per cent, became negative to all parasites.

TABLE 2.—*Effects of one dose of carbon tetrachloride.*

Parasite.	Before treatment.	After treatment.	Improvement.
	Per cent.	*Per cent.*	*Per cent.*
Hookworm	100	31	69
Ascaris	67	10	57
Trichuris	60	60	0

Table 3 shows the number of hookworms removed, after two treatments given at intervals of five or six days, from nine Carcar cases. It will be noted that 98 per cent of the worms were removed by the first dose.

TABLE 3.—*Showing worm count after two doses of carbon tetrachloride.*

Name.	First treatment.	Second treatment.
1. N. R.	23	0
2. V. S.	245	2
3. O. S.	6	7
4. M. C.	118	4
5. M. S.	6	1
6. C. P.	69	0
7. V. M.	46	0
8. A. F.	29	2
9. E. F.	241	0
Total.	783	16

Table 4 shows the efficiency of the Cropper and Row method compared with direct smear examination in the detection of hookworm ova. It will be noted that the *Ascaris* ova, owing to their lightness, float with the ether and the coarser particles of the fæces, so that not so many are found in the centrifuged preparation. Hence no marked improvement is shown.

TABLE 4.—*Showing the advantage of the concentration method over the direct examination method.*

Parasite.	On 40 specimens from Argao.			On 100 stools from Dalaguete, Sibonga, Boljoon, and Alcoy, negative for hookworm.		
	Direct examination.	Concentration (Cropper and Row).	Improvement.	Direct examination.	Concentration (Cropper and Row).	Improvement.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Hookworm	8	40	32	0	55	55
Ascaris	75	80	5	87	85	2
Trichuris	43	68	25	56	75	9

Table 5 shows that oxyuriasis should be diagnosed only by screening the fæces, not by microscopic search for ova, owing to the habit of the parasites of laying their eggs outside of the anus.

TABLE 5.—*Showing advantage of the screen index over the microscopic index.*

Town.	Microscopic index.	Screen index.
	Per cent.	*Per cent.*
Dumanjug	0	50
Barili	0	82
Oslob	1	87

Table 6 shows the genus and sex of the worms classified from three towns. About 23 per cent were *Ankylostoma* and the rest *Necator*.

TABLE 6.—*Showing genus and sex of worms classified.*

Place.	Number of worms classified.	*Ankylostoma.*				*Necator.*			
		Number.	Per cent.	Male.	Female.	Number.	Per cent.	Male.	Female.
Carcar	180	44	24	[a]	[a]	136	76	[a]	[a]
Sibonga	434	87	21	39	48	347	79	129	218
Argao	88	20	23	7	13	68	77	23	45

[a] Not classified.

Tables 7 and 8 show the parasitic incidence in all the towns surveyed. Due to the large area covered by the city of Cebu it was divided into fourteen districts and each district was surveyed. The average hookworm index for the city was 71.5 per cent; for the whole province, 77.5.

TABLE 7.—*Showing parasitic incidence in the city of Cebu, 1st sanitary division, by districts.*

District No.	Hookworm.	*Ascaris.*	*Trichuris.*	One or all three of the parasites.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1	68	84	76	100
2	80	84	72	100
3	52	88	76	92
4	76	80	68	96
5	96	72	60	100
6	56	84	84	96
7	60	68	64	96
8	52	72	84	96
9	84	72	64	100
10	32	64	84	96
11	52	84	84	100
12	96	84	92	100
13	92	76	68	100
14	96	80	80	100

TABLE 8.—*Showing parasitic incidence in the towns surveyed.*

Municipality.	Hookworm.	*Ascaris.*	*Trichuris.*	One or all three of the parasites.	Remarks.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	
2D SANITARY DIVISION.					
Opon	84	76	36	96	
Consolacion	88	72	48	100	
Mandawe	96	80	64	100	
Cordova					Unsurveyed.
3D SANITARY DIVISION.					
Danao	96	62	62	100	
Liloan	80	84	64	96	
Compostela	84	84	57	100	
Carmen	83	66	42	100	
4TH SANITARY DIVISION.					
San Francisco	68	92	48	96	
Poro	92	40	80	100	
5TH SANITARY DIVISION.					
Tudela	88	72	32	100	
Pilar	72	80	12	100	
6TH SANITARY DIVISION.					
Catmon	84	59	35	97	
Borbon	100	95	90	100	
Tabogon	97	100	70	100	
Sogod	97	83	11	100	
7TH SANITARY DIVISION.					
Bogo	86	80	25	100	
San Remigio	100	95	71	100	
Medellin	83	73	71	100	
Daan-Bantayan	84	81	34	100	
8TH SANITARY DIVISION.					
Bantayan	47	87	87	100	
Santa Fe	28	88	80	100	
Medridejos	72	96	56	100	

TABLE 8.—*Showing parasitic incidence in the towns surveyed*—Continued.

Municipality.	Hookworm.	*Ascaris.*	*Trichuris.*	One or all three of the parasites.	Remarks.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	
9TH SANITARY DIVISION.					
Asturias	90	93	64	96	
Tuburan	83	67	46	100	
Balamban	88	80	64	100	
10TH SANITARY DIVISION.					
Toledo	87	87	40	100	
Pinamungajan	89	46	67	100	
Aloguinsan	100	32	6	100	
11TH SANITARY DIVISION.					
Dumanjug	93	83	76	100	*Oxyuris*, 50 per cent by screen.
Ronda	80	70	40	100	Surveyed by Leach.
Barili	83				*Oxyuris*, 82 per cent by screen.
12TH SANITARY DIVISION.					
Badian	76	85	55	94	
Alcantara	74	84	26	100	
Moalbual	65	90	75	100	
Alegria	60	92	52	100	
13TH SANITARY DIVISION.					
Ginatilan	52	80	68	96	
Malabuyoc	91	100	82	100	
Samboan	67	100	75	100	
Santander	96	88	64	100	
14TH SANITARY DIVISION.					
Dalaguete	70	88	80	100	
Oslob	68	96	68	100	*Oxyuris*, 87 per cent by screen; one case discharged 3 adult tapeworms.
Boljoon	27	77	77	95	
Alcoy	54	92	67	96	

TABLE 8.—*Showing parasitic incidence in the towns surveyed*—Continued.

Municipality.	Hookworm.	*Ascaris.*	*Trichuris.*	One or all three of the parasites.	Remarks.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	
15TH SANITARY DIVISION.					
Carcar	77	61	53	94	
Argao	42.5	87	67.5	100	Two cases of tæniasis.
Sibonga	83	91	72	98	
16TH SANITARY DIVISION.					
Naga	78				Surveyed by Leach.
San Fernando	62				Do.
Minglanilla	92	71	17	100	
Talisay	60	76	60	96	

Due to high infection incidence, not only of hookworm but also of *Ascaris* and *Trichuris*, mass treatment was given in all towns. Nearly 30,000 persons were given treatment without a single fatality. This was due to the care in excluding undesirable cases and to the use of repurified carbon tetrachloride only.

Due credit should be given to Dr. Sulpicio Chiyuto, District Health Officer of Cebu, for his efforts in carrying out the campaign during my absence, and to all of his health personnel for their interest and coöperation.

HORSE PARASITES COLLECTED IN THE PHILIPPINE ISLANDS

By BENJAMIN SCHWARTZ and ELOISE B. CRAM

Of the Zoölogical Division, Bureau of Animal Industry, United States Department of Agriculture, Washington

THREE PLATES

INTRODUCTION

With the exception of four species of horse parasites that have been previously reported by the senior author from the Philippine Islands, the helminths that are listed in this paper are reported for the first time as parasites of Philippine horses. The previously published records are as follows: *Ascaris equorum* Goeze, 1782, reported in 1922;(14) *Anoplocephala perfoliata* (Goeze, 1782) and *Anoplocephala mamillana* (Mehlin, 1831) reported in 1922;(13) and *Oxyuris equi* (Schrank, 1788) reported in 1922 and 1923.(12, 15) The occurrence of strongyles (*Strongylus* Mueller, 1780, and *Cylicostomum* Railliet and Henry, 1902) in Philippine horses was also reported in 1923,(12) but no specific determinations were given.

The parasites listed in this paper were collected from about fifteen native horses that were autopsied at various times at the College of Veterinary Science, Los Baños, Laguna Province, between January, 1921, and March, 1923. The horses came from several provinces of Luzon.

TREMATODA

No trematodes were encountered in Philippine horses.

CESTODA

Cestodes belonging to the genus *Anoplocephala* are of common occurrence in Philippine horses.

Genus ANOPLOCEPHALA E. Blanchard, 1848

Three species of this genus occur in the large intestine of horses, but only two species have been found in the Philippine Islands; *Anoplocephala magna*, the largest of the three species, apparently is absent.

Anoplocephala perfoliata (Goeze, 1782). Plate 1, fig. 1.

Total length, 8 to 25 millimeters, but larger specimens, up to 8 centimeters, have been reported. Head prominent, 2 to 3 millimeters wide. Philippine specimens seldom exceed 3 centimeters in length. This species is very common in Philippine horses.

Collected from the cæcum.

This species is considered to be injurious to horses, causing inflammation of the mucosa.

Anoplocephala mamillana (Mehlis, 1831).

This species is readily recognized by its smaller head, which is only 0.7 millimeter wide, and by its smaller size. Found only once, in a Philippine horse.

Location not recorded.

NEMATODA

Ascaris equorum Goeze, 1782.

This species is not very common in adult horses, and infestations are light. However, the fact that only adult horses were autopsied may account for the comparative scarcity of the parasite.

Collected from the small intestine.

Oxyuris equi (Schrank, 1788). Plate 1, fig. 3.

Females exhibit considerable size variation (0.5 to 15 centimeters) due largely to variation in the length of the tail. Comparatively short-bodied females with very long tails and long-bodied females with short tails were found in the Philippine material. The differences in behavior of these two types of females were discussed by the senior author in a previous paper.(15) Males are about 1 centimeter long and are very scarce.

Collected from colon, cæcum, and rectum. Very common.

Probstmayria vivipara (Probstmayr, 1865). Plate 2, figs. 3 and 4.

These are small, slender, transparent nematodes, from 2.5 to 3 millimeters long. The œsophagus consists of a long slender portion and a bulbous base containing a denticular apparatus. Male has two subequal spicules but no bursa. Vulva of female located at about middle of body. Eggs hatch in uterus.

Collected once, from the cæcum of a horse. Parasites were very abundant and, in addition to adults, numerous larvæ in various stages of development were found.

Genus **STRONGYLUS** Mueller, 1780

Three species of this genus have been recorded from the large intestine of horses and all three were collected from horses in the Philippine Islands.

Species of *Strongylus* are attached to the mucosa and are blood red in color due to the fact that they feed on the blood of the host.

Strongylus equinus Mueller, 1780. Plate 2, fig. 1.

According to Looss the adults of this species measure 35 millimeters in length (male) and 45 to 47 millimeters (female). Specimens of this species from Philippine horses are smaller; they measure 25 millimeters (male) and 36 to 38 millimeters (female). This species may be readily distinguished from *S. edentatus* by the fact that it possesses three teeth at the base of the mouth capsule. Railliet(8) found larvæ of this species in the pancreas and the gastrohepatic ligament.

Common in Philippine horses, but less abundant than the two other species of *Strongylus*.

Collected from cæcum.

Strongylus edentatus (Looss, 1900). Plate 2, fig. 2.

This species may be readily distinguished from *S. equinus* by the absence of teeth in the mouth capsule. The length of specimens from Philippine horses is the same as that given by Looss; namely 23 to 27 millimeters (male) and 30 to 38 millimeters (female). Railliet(8) found the larval stages of this parasite in the subperitoneal connective tissue at the right side of the body and in other locations. This is the most abundant species of the genus in Philippine horses.

Collected from the cæcum.

Strongylus vulgaris (Looss, 1900). Plate 3, fig. 6.

This is the smallest of the three species of *Strongylus*. According to Looss the males are from 14 to 16 millimeters long and the females from 23 to 24. It has a single tooth with two prominent projections at the base of the mouth capsule.

Railliet(8) found larval stages of this parasite in submucous nodules of the walls of the large intestine.

Common in the cæcum of Philippine horses.

Strongylus vulgaris is responsible for the formation of verminous aneurisms in horses and other equine animals.

Genus **TRIODONTOPHORUS** Looss, 1902

Five species of this genus have been described from the horse. Of these, *T. serratus* described by Looss,(6) and two species, *T. tenuicollis* and *T. brevicauda*, described by Boulenger,(1) have not been found among the specimens from Philippine horses.

This genus is easily recognized by the three large teeth, each consisting of two plates, projecting into the cavity of the mouth capsule. The teeth may or may not be denticulated.

Ransom and Hadwen(11) called attention to the fact that extensive ulcerations of the mucosa of the colon of horses is associated with infestation of at least one species of the genus; namely, *T. tenuicollis*.

Triodontophorus minor (Looss, 1900).

The average length of adults of this species is 13 millimeters (male) and 14 millimeters (female). A single specimen of each sex was found among parasites collected from the colon of a Philippine horse. Looss and later writers have noted that this species inhabits the posterior thickened portion of the large loop of the colon, whereas the other species occur in the first third of the colon and in the cæcum. The most-distinctive features of this species are the long median lobe of the bursa, and the distance of the vulva (535 to 700 μ) from the posterior end.

Triodontophorus intermedius Sweet, 1909. Plate 3, fig. 1.

This species was found in small numbers in the cæcum of Philippine horses. The males of this species measure 14.5 to 15.5 millimeters and the females 16.5 to 18.7. The median lobe of the bursa of the male is short, but the tail region of the female is elongated, the vulva being 1.4 to 1.7 millimeters from the posterior end of the worm.

Genus **GYALOCEPHALUS** Looss, 1900

The type species of this genus, *Gyalocephalus capitatus* (Looss, 1900), was the only recognized species of the genus until Yorke and Macfie(15) described *G. equi*, differentiating this species from *G. capitatus* by the genital cone of the male which, in the former species, projects for a considerable distance beyond the free margin of the bursa. The length of the cone in *G. equi* was found to be twice that given by Looss for *G. capitatus*. Ihle,(5) however, concludes from a study of many

specimens that the length of the cone is variable and that there is only one species of this genus.

These forms are recognized by the very large, hemispherical œsophageal funnel, from the walls of which three large teeth project into the posterior part of the short mouth capsule. The internal leaf crown elements are large and stout. The œsophagus narrows markedly for a distance, just posterior to the strongly widened œsophageal funnel.

Gyalocephalus capitatus Looss, 1900. Plate 2, fig. 5.

This parasite was found in only one of the Philippine horses examined, but in that case there were numerous specimens in the cæcum and colon. It has hitherto not been reported from this part of the world. Boulenger(3) did not find it in horses of the Punjab, nor(2) in Asia or East Africa.

Philippine specimens are slightly larger than the specimens described by Looss, the males being 8.5 to 9 millimeters long and the females 10 to 11.5.

Genus **POTERIOSTOMUM** Quiel, 1919

This genus is rather closely related to *Cylicostomum* but differs from the latter in the arrangement of the rays of the bursa and in the structure of the posterior extremity of the female. In the bursa of *Poteriostomum* species the externodorsal and dorsal rays arise from a common trunk. The anus and vulva of the female are comparatively far apart so that the tail region appears long and tapering. Three species have been described. Two of these, *P. pluridentatum* Quiel, 1919, and *P. ratzii* (Kotlan, 1919), were not found in the Philippine material. *Poteriostomum pluridentatum* is considered by Ihle(4) and Boulenger(3) as merely a variety of the type species, *P. imparidentatum.*

Poteriostomum imparidentatum Quiel, 1919. Plate 3, fig. 2.

Only a few specimens of this parasite were found in the colon of two Philippine horses. They were slightly smaller than the average size heretofore recorded for this species. The males measure 11 millimeters and the females 13 to 14.

This species is recognized by the dissimilarity of six elements of the internal leaf crown, two lateral and four submedian elements being much longer than the others.

Genus **CYLICOSTOMUM** Railliet and Henry, 1902

This genus contains a much larger number of species than do the other genera of horse strongyles. There are thirty-five described species from the large intestine of the horse and other equines. The majority of these worms are so small (from 5 to 15 millimeters) that magnification with a high-power microscope is necessary to enable one to determine structural details. Differentiation of the species can be made only after considerable study.

According to Looss,(6) in their adult stages, cylicostomes are never found adhering to the mucous membrane of the intestine; they are not bloodsuckers, but they ingest vegetable débris and small organisms, such as Infusoria and minute nematodes.

The important characters for differentiating this genus are as follows: External and internal leaf crowns present, the number and size of the elements varying greatly; mouth capsule comparatively short, its walls never giving rise to teeth; externodorsal and dorsal rays of the bursa arise from separate trunks; anus and vulva comparatively close to each other.

In Philippine horses ten recognized species of *Cylicostomum*, as well as one or more species which do not conform to those already described, were encountered. In one horse we found nine species of *Cylicostomum*.

Cylicostomum insigne (Boulenger, 1917). Plate 3, fig. 7.

This species was the one found most frequently and in greatest numbers in Philippine horses. This finding corresponds with that of Boulenger(3) in his study of parasites of horses in the Punjab. He notes that the adults were restricted to the posterior part of the colon, whereas the larvæ were found in the cæcum, most of them encysted in the submucosa.

This species has been identified as *Trichonema tetracanthus* by Railliet.(9) He believes it to be the species originally described by Mehlis in 1831 as *Strongylus tetracanthus*.

Cylicostomum nassatum var. parvum Yorke and Macfie, 1918.

Although this species is not as common as *C. insigne*, it was found in four Philippine horses in considerable numbers.

Cylicostomum pseudocatinatum Yorke and Macfie, 1918.

This species ranks with *G. nassatum* var. *parvum* in frequency of occurrence in horses in the Philippines. It is con-

sidered by Ihle(5) to be a variety of *C. catinatum* of Looss,(6) and not a distinct species.

Cylicostomum longibursatum Yorke and Macfie, 1918.

This species was found in small numbers in three Philippine horses. It is a very small worm, both sexes measuring 4.5 millimeters in these specimens. One male possessed an unusually long bursa, the dorsal ray measuring 747 μ, whereas according to Ihle(5) the lengths recorded are 594 to 659 μ.

Cylicostomum leptostomum Kotlan, 1920.

This species was collected in small numbers from the large intestine of three Philippine horses. Reports of its occurrence have been hitherto limited to Hungary, Holland, and the United States.

Cylicostomum coronatum (Looss, 1900).

This species was found in four Philippine horses, in one of them in fairly large numbers. One male specimen differed from the others in having a very large dermal collar.

Boulenger(3) reports this species as very common in the Punjab.

Cylicostomum calicatum (Looss, 1900).

This species was found only twice, and in small numbers.

Cylicostomum goldi var. tridentatum (Yorke and Macfie, 1920).

Only a few specimens of this species were found in two Philippine horses. It was originally described as an independent species, *C. tridentatum,* but was made a variety of *C. goldi* by Ihle.(5)

Cylicostomum bicoronatum (Looss, 1900).

This species was found only once, and was not numerous, in the material from Philippine horses.

Cylicostomum euproctus (Boulenger, 1917).

A male and a female, in copula, were found in the colon of a Philippine horse.

Genus **HABRONEMA** Diesing, 1861

Three species of this genus occur in the stomach of the horse, and all three were collected in the Philippine Islands. *Habronema megastoma* may be distinguished from *H. muscae* and *H. microstoma* by its smaller size and by the fact that it

occurs in tumors in the mucosa of the stomach, whereas the two other species occur free in the lumen or attached to the mucosa.

Habronema megastoma (Rudolphi, 1819).

The males are from 7 to 10 millimeters in length and the females from 10 to 13.

These parasites were collected from small tumors in the stomach of several horses.

Habronema microstoma (Schneider, 1866). Plate 3, fig. 5.

According to Ransom(10) this species varies in length from 9 to 16 millimeters (male) and 15 to 25 millimeters (female), and may be readily recognized by the fact that the vagina in the region of the S-shaped curve is surrounded by a globular mass of muscular tissue. Left spicule of male, 800 μ long; right spicule, 350.

Found in a bottle containing horse strongyles.

Habronema muscae (Carter, 1861). Plate 3, fig. 3.

According to Ransom(10) this species varies in length from 8 to 14 millimeters (male) and 13 to 22 millimeters (female), and may be distinguished from *Habronema microstoma* by the fact that the vagina passes halfway around the body before it enters the body cavity and is without the distal S-shaped curve surrounded by a muscle bulb. Left spicule of male, 2.5 millimeters long; right spicule, 500 μ long. This species appears to be commoner than *Habronema microstoma*.

Collected from the stomach, free in the lumen, and adhering to the mucosa.

Setaria equina (Abildgaard, 1789). Plate 1, fig. 2; Plate 3, fig. 4.

The males of this species are from 6 to 8 centimeters long and have a spirally coiled tail. The females are from 9 to 12 centimeters long and have a slightly coiled tail.

This parasite was found very commonly in the peritoneal cavity, and on one occasion it was found in the jejunum. While the possibility that the worm may have found its way into the intestine during the autopsy of the horse is not absolutely excluded, there is no good reason to believe that this actually occurred. According to Neveu-Lemaire(7) *Setaria equina* has been occasionally found in the intestine.

SUMMARY

In the following table the species of horse parasites recorded in this paper are arranged in accordance with their location in the body of the host, and the frequency of their occurrence in the Philippines is indicated.

TABLE 1.—*Distribution of horse parasites in the body of the host.*

Stomach:
- *Habronema megastoma*, common.
- *Habronema muscae*, common.
- *Habronema microstoma*, apparently uncommon.

Small intestine:
- *Anoplocephala mamillana*, rare.
- *Ascaris equorum*, fairly common.
- *Setaria equina*, rare.

Large intestine:
- *Anoplocephala perfoliata*, very common.
- *Oxyuris equi*, very common.
- *Strongylus equinus*, fairly common.
- *Strongylus edentatus*, very common.
- *Strongylus vulgaris*, common.
- *Triodontophorus minor*, rare.
- *Triodontophorus intermedius*, fairly common.
- *Gyalocephalus capitatus*, rare. Found in one horse; parasites very abundant.
- *Poteriostomum imparidentatum*, fairly common.
- *Cylicostomum insigne*, very common.
- *Cylicostomum nassatum* var. *parvum*, very common.
- *Cylicostomum pseudocatinatum*, very common.
- *Cylicostomum longibursatum*, common.
- *Cylicostomum coronatum*, common.
- *Cylicostomum leptostomum*, fairly common.
- *Cylicostomum calicatum*, fairly common.
- *Cylicostomum goldi*, fairly common.
- *Cylicostomum euproctes*, rare.
- *Cylicostomum bicoronatum*, rare.
- *Probstmayria vivipara*, rare. Found in one horse; parasites very abundant.

Abdominal cavity:
- *Setaria equina*, common.

REFERENCES TO LITERATURE CITED

1. BOULENGER, CHARLES L. Sclerostome parasites of the horse in England. I. The genera Triodontophorus and Oesophagodontus. Parasitology, Cambridge [Eng.] 8 (1916) 420–439.
2. BOULENGER, CHARLES L. Sclerostomes of the donkey in Zanzibar and East Africa. Parasitology, Cambridge [Eng.] 12 (1920) 27–32.

3. BOULENGER, CHARLES L. Strongylid parasities of horses in the Punjab. Parasitology, Cambridge [Eng.] 13 (1921) 315–326.
4. IHLE, J. E. W. Bemerkungen über die Gattungen Cylicostomum, Poteriostomum und Craterostomum. Centralbl. f. Bakt., [etc.], Jena, 1. Abt. 85 (1920) Orig., figs. 1–2.
5. IHLE, J. E. W. Report of the commission appointed to inquire into the Sclerotomiasis in Holland. I. Zoological part. 1. The adult strongylids (sclerostomes) inhabiting the large intestine of the horse. The Hague (1922) 1–118.
6. LOOSS, ARTHUR. The Sclerostomidae of horses and donkeys in Egypt. Rec. Egypt Govt. School Med., Cairo (1902) 25–139.
7. NEVEU-LEMAIRE, M. Parasitologie des animaux domestiques. J. Lamarre et Cie., Paris (1912).
8. RAILLIET, A. L'emploi des medicaments dans le traitement des maladies causées par des nématodes. Rep. 10. Internat. Vet. Cong., London (August, 1914) 3 (1915) 733–749.
9. RAILLIET, A. Les Strongyles (anciens Sclérostomes) et les strongyloses proprement dites. Rec. de méd. vét., Par. 99 (1923) 377–396.
10. RANSOM, B. H. The life history of Habronema muscae (Carter), a parasite of the horse transmitted by the house fly. Bur. Animal Ind. U. S. Dept. Agr. Bull. 163 (1913) 1–36.
11. RANSOM, B. H., and S. HADWEN. Horse strongyles in Canada. Journ. Am. Vet. Med. Assoc. 53 (1918) n. s., 6: 202–214.
12. SCHWARTZ, BENJAMIN. Abstract of paper. La dyspepsie et le complexus symptomatique lié au parasitisme gastro-intestinal par M. de Dr. Roger. Philip. Agr. 11 (1922) 95–96.
13. SCHWARTZ, BENJAMIN. Some cestodes from domestic animals in the Philippine Islands, that are of economic and hygienic importance. Philip. Agr. 11 (1922) 113–116.
14. SCHWARTZ, BENJAMIN. Ascarid infestations of domestic animals in the Philippine Islands. Philip. Agr. Rev. 15 (1922) 246–251.
15. SCHWARTZ, BENJAMIN. Observations on the life history of the horse oxyurid (Oxyuris equi). Philip. Journ. Sci. 23 (1923) 35–49.
16. YORKE, W., and J. W. S. MACFIE. Strongylidae in horses. IV. Gyalocephalus capitatus, Looss. V. Gyalocephalus equi, sp. nov. Ann. Trop. Med. & Parasitol. 12 (1918) 79–92.

ILLUSTRATIONS

Plate 1

Fig. 1. *Anoplocephala perfoliata* (Goeze); *a*, natural size; *b*, enlarged, × 2. (Original.)

2. *Setaria equina* (Abildgaard); *a*, female; *b*, male; natural size. From Neumann (1892) fig. 285.

3. *Oxyuris equi* (Schrank); females, outline drawings showing variation in length; long-tailed females with comparatively short bodies are shown at the bottom of the series; natural size. (Original.)

Plate 2

Fig. 1. *Strongylus equinus* Mueller; anterior extremity, lateral view, × 58. After Looss (1902) pl. 1, fig. 4.

2. *Strongylus edentatus* (Looss); anterior extremity, lateral view, × 58. After Looss (1902) pl. 1, fig. 9.

3. *Probstmayria vivipara* (Probstmayr); male, lateral view, × 54. After Ransom (1913).

4. *Probstmayria vivipara* (Probstmayr); parturient female, lateral view, × 54. After Ransom (1905).

5. *Gyalocephalus capitatus* Looss; anterior extremity, ventral view, × 90. After Yorke and Macfie (1918) fig. 1.

Plate 3

Fig. 1. *Triodontophorus intermedius* Sweet; anterior extremity, right lateral view, × 150. After Boulenger (1916) fig. 2A.

2. *Poteriostomum imparidentatum* Quiel; anterior extremity, ventral view, × 180. After Yorke and Macfie (1920) 161, fig. 1.

3. *Habronema muscae* (Carter); adult, anterior extremity, × 280. After Ransom (1913).

4. *Setaria equina* (Abildgaard); cephalic extremity, × 150. From Neumann (1892) fig. 286.

5. *Habronema microstoma* (Schneider); female, region of vulva, × 160. After Ransom (1913).

6. *Strongylus vulgaris* (Looss); anterior extremity, lateral view, × 59. After Looss (1902) pl. 2, fig. 13.

7. *Cylicostomum insigne* (Boulenger); anterior extremity, dorsal view, × 72. After Boulenger (1917) fig. 3A.

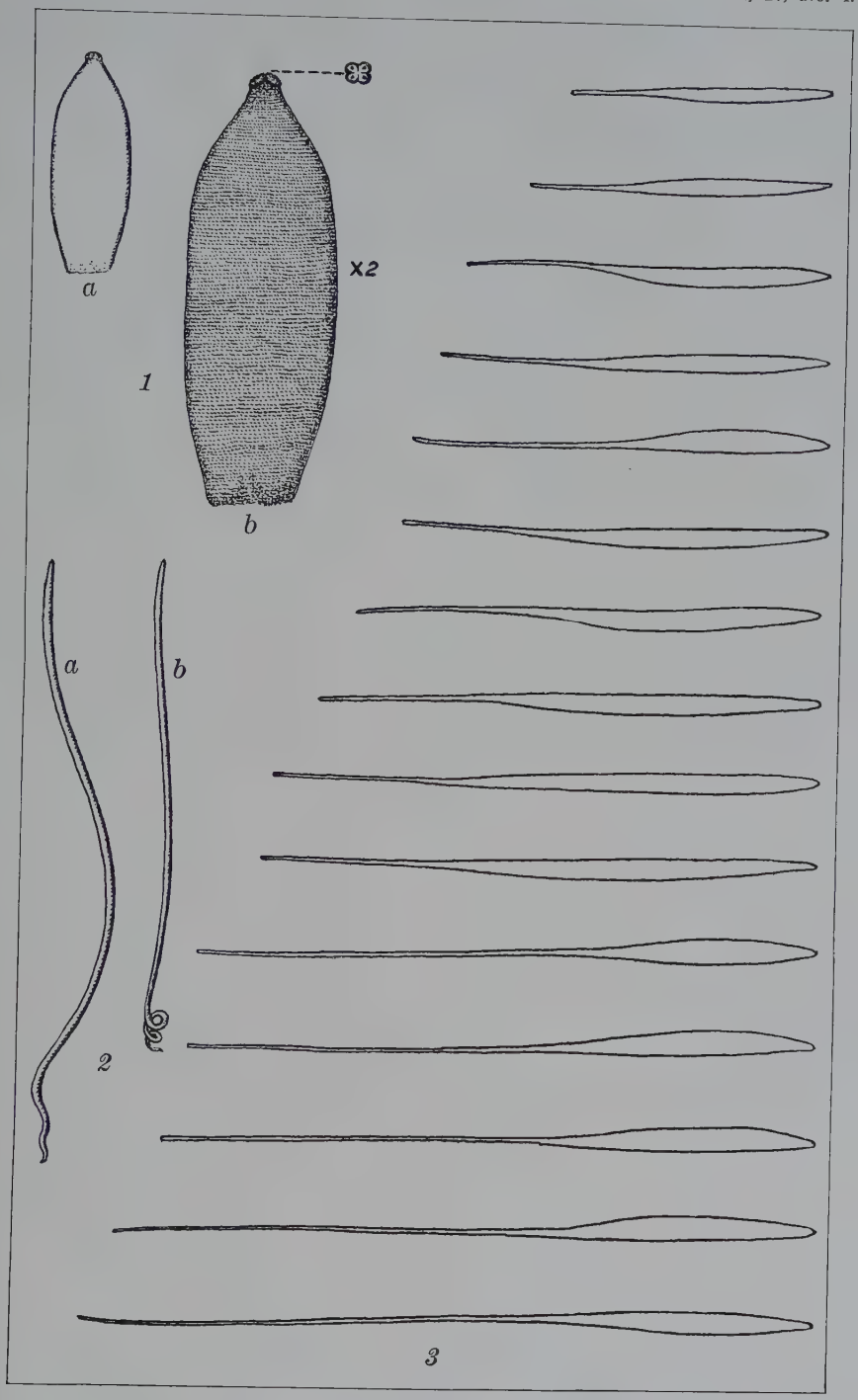


PLATE 1.

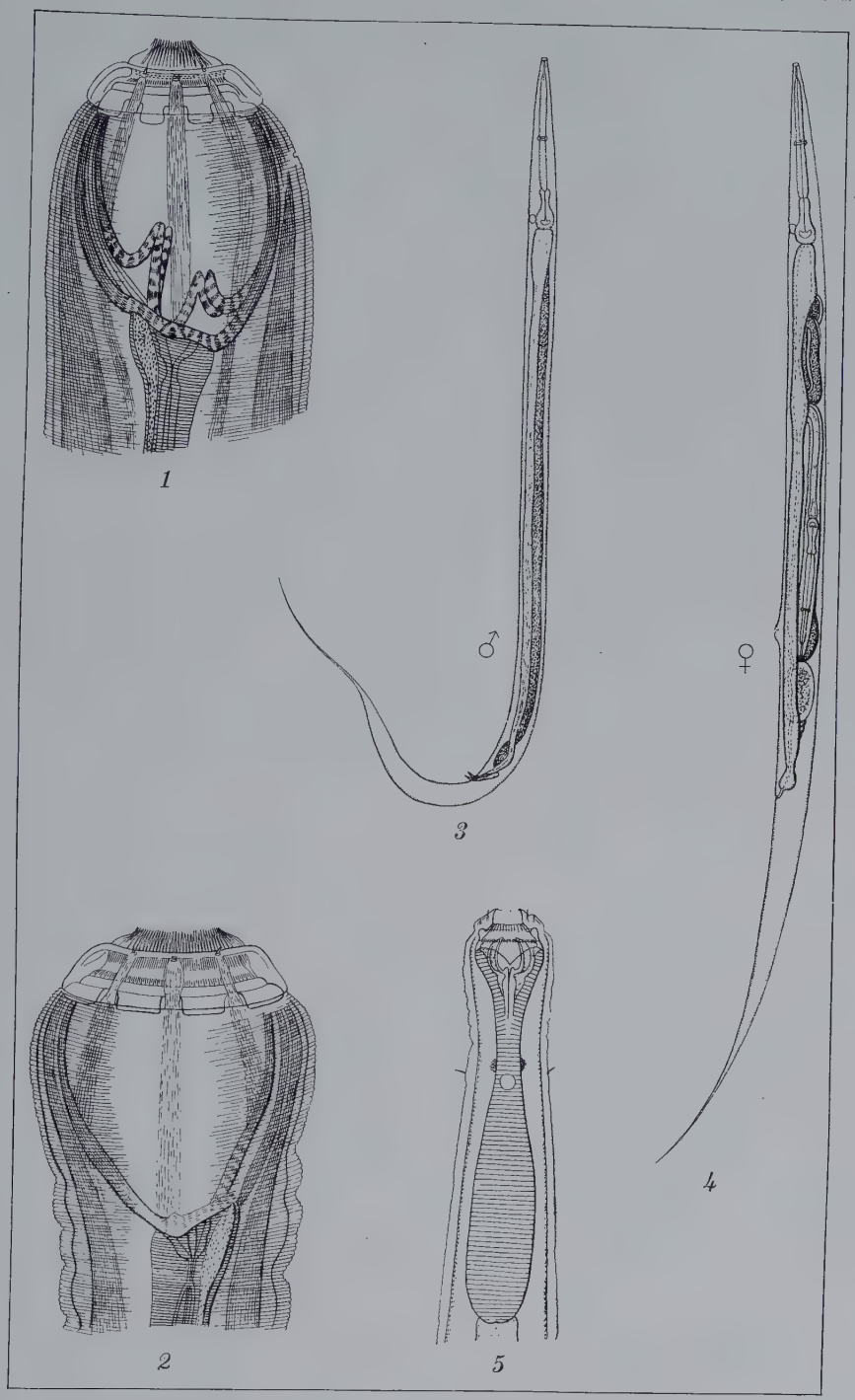


PLATE 2.

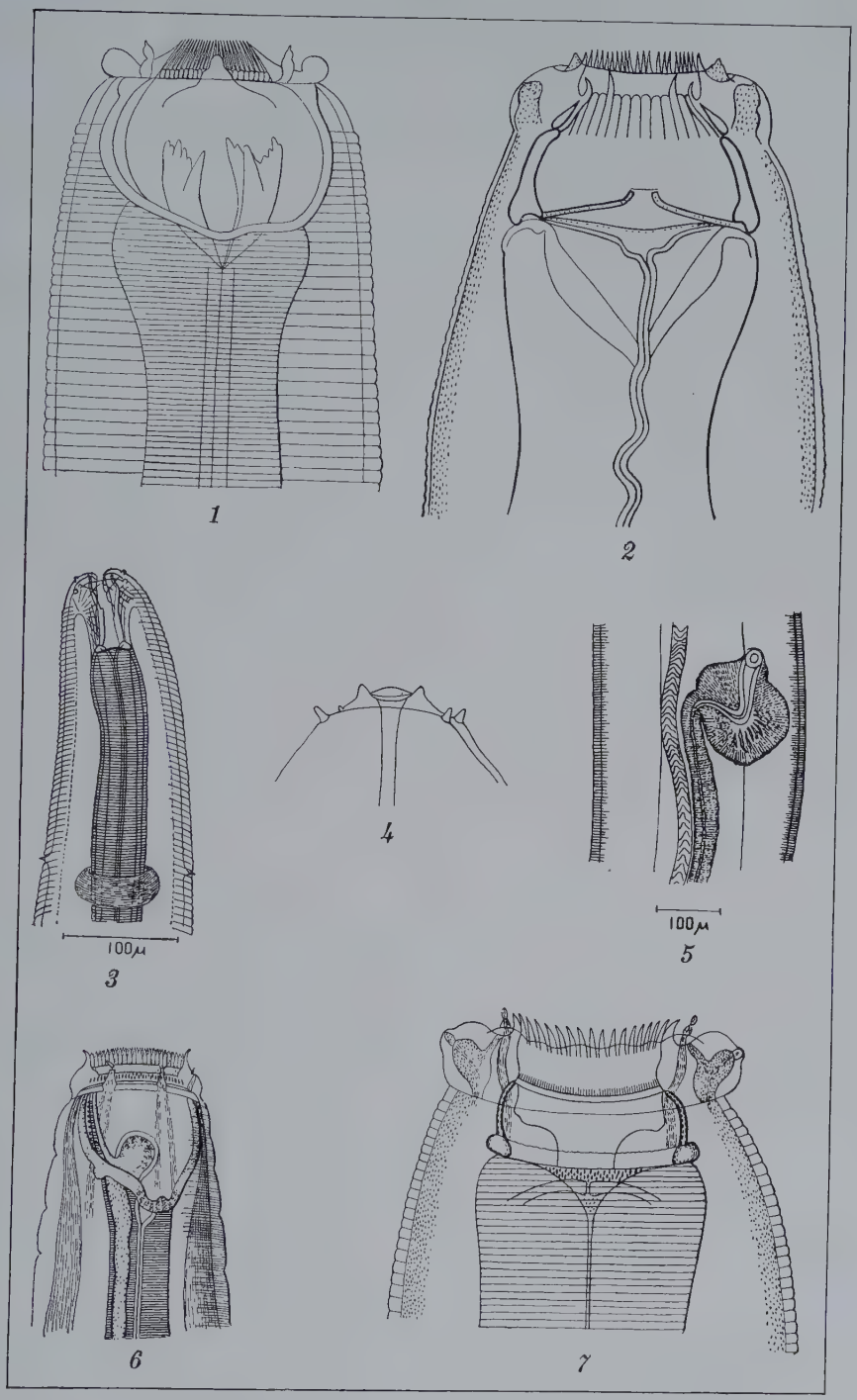


PLATE 3.

TWO STRANGE NEW FISHES FROM LUZON

By Albert W. C. T. Herre

Chief, Division of Fisheries, Bureau of Science, Manila

TWO PLATES

PHALLOSTETHIDÆ

This family comprises perhaps the most remarkable fishes known to the scientific world. The males are characterized by an extraordinary muscular organ attached to and projecting from the throat or the lower side of the head, like some strange malformation. This appendage has the anus near the middle of one side, and at the free or rear end, or at the tip of an outgrowth from it, is the genital opening. In the adult males there are one or two external movable bones articulated upon it; there may be one on each side or one or two upon one side only; they may be short or long and slender, straight or curved, spine-bearing or with the free end curved and hooklike or dilated and clawlike; they are the toxactinium and ctenactinium of Regan. This appendage with its complicated structures is a copulatory organ or priapium. In individuals of the same species the openings and particular bony appendages may be upon either the right or the left side.

There are no ventral fins; the first dorsal is absent or minute and very far back; the second dorsal is small and behind or over the posterior end of the much longer anal; the pectoral fins are placed rather high up on the sides.

In the female the throat and the region below the pectoral fins are smooth and scaleless and contain the anal and genital openings; genital papillæ are also present in some species; in both sexes, behind this region, a keel or rayless fold of skin extends along the middle line of the abdomen to the anal fin. The body is strongly compressed, and rather slender. The head is scaleless, as is the nape posteriorly beyond the pectoral bases; the scales are rather small and cycloid. The mouth is very oblique, with minute sharp-pointed teeth of uniform or nearly uniform size. There are from 34 to 40 vertebræ.

Two genera and three species have been described from Johore and Singapore, where they occur in brackish water. It

was altogether unexpected that I should discover a new genus and two new species of this singular group in Luzon, in mountain creeks remote from the sea.

C. Tate Regan has described in great detail the external and internal structure of the genera and species made known by him, and he states that the priapium is an entirely new organ. It has a highly developed skeleton with a number of new elements which are not homologous with any parts of the skeleton of other fishes.

Further information concerning this remarkable group can be had from Regan's papers.[1]

Key to the genera of Phallostethidæ.

a^1. One dorsal fin.
  b^1. A toxactinium present in males; ctenactidium serrated; vertebræ 40; dorsal 8 to 10; anal 26 to 28..... **Phallostethus.**
  b^2. No toxactinium; ctenactinium smooth; vertebræ 34 to 36; dorsal 5 or 6; anal 13 or 16..... **Neostethus.**
a^2. Two dorsals, the first of 2 spines..... **Gulaphallus.**

Genus **GULAPHALLUS** [2] novum

The principal character distinguishing this genus is the presence of a very small spinous dorsal, composed of two spines and their connecting membrane, and placed a short distance in front of the second dorsal. The adult males have a remarkable structure, the priapium or copulatory organ, which is an outgrowth from the underside of the head and throat and which agrees in general structure with those of the previously known genera. There is a long, slender, bow-shaped external bone, the toxactinium, growing from the posterior part of the priapium on one side and extending forward to the chin or beyond; on the other side, or on the median line, is another external bone, the ctenactinium, which is much shorter and broader, partially erect or strongly curved over the priapium to the opposite side, and with an expanded or hooked tip. Between these bones and at or near the posterior end of the priapium is attached the genital papilla, which may be a long and penislike structure, with an expanded tip where the open-

[1] Phallostethus dunckeri, a remarkable new cyprinodont fish from Johore, Ann. & Mag. Nat. Hist. VIII 12 (1913) 548. The morphology of the cyprinodont fishes of the subfamily Phallostethinæ, with descriptions of a new genus and two new species, Proc. Zool. Soc. London (1916) 1.

[2] *Gula*, throat; *phallus*.

ing of the vas deferens lies. Since no one has observed living fishes of this family, the mode of using the priapium with its strange bones is not clearly known.

The other characters are in the main those given for the family. The scales vary from 36 or 38 to 56 or 58. Two species have thus far been discovered in Luzon.

Key to the species of Gulaphallus.

a^1. Scales in lateral series 56 to 58..... **G. eximius.**
a^2. Scales in lateral series 36 to 38..... **G. mirabilis.**

Gulaphallus eximius [3] sp. nov. Plate 1; Plate 2, figs. 1 and 2.

First dorsal II; second dorsal I-6; anal I, 14 to 16; there are 56 to 58 scales in a longitudinal series from the gill opening to the caudal fin and 14 counting from the origin of the second dorsal to that part of the anal directly below, or 18 from the origin of the dorsal to that of the anal; there are 28 scales between the first dorsal and the naked region on the nape.

Body strongly compressed, with the dorsal profile very little elevated but the ventral one strongly convex; two female specimens, 34 and 35 millimeters long, had the depth contained 4.25 to 4.75 times in the length; head small, with bluntly rounded snout and projecting chin, and contained $5\frac{2}{3}$ to $5\frac{5}{6}$ times in the length; mouth small and nearly vertical, with two rows of fine pointed teeth in each jaw; front teeth of outer row in upper jaw a little larger than the rest; upper maxillary does not quite extend to margin of eye or it may exceptionally reach to a point below it; eye contained 3 times in length of head; snout three-fourths of an eye diameter in length; interorbital space flat or slightly concave and a fourth broader than an eye diameter; least depth of caudal peduncle contained twice in depth; pectoral bases thick, muscular, and attached only basally; length of forked caudal fin equal to or slightly greater than depth.

In a male specimen, 35 millimeters long, the depth is contained 5.2 times in the length, the head about 5.5 times; snout a little shorter than eye, which is contained 3 times in head; interorbital space equals eye. From the posterior end of the priapium extend forward two bones; at the outer corner of the right side is articulated a long, slender, circular, and irregularly curved bone which extends forward at least as far as

[3] *Eximius*, extraordinary.

the chin, around which it curves; in other specimens this bone is on either the right or the left side but is always on the same side as the anus and is the equivalent of Regan's toxactinium in *Phallostethus* and his ctenactinium in *Neostethus*. On the opposite side of the priapium a little in advance of the hinder end, is articulated a much shorter, broad, hooklike bone which curves over to the other side; its tip is not farther forward than the hinder part of the eye; this is the same as Regan's ctenactinum in *Phallostethus*.

From the posterior end of the priapium, at the corner opposite the first bone described, grows an elongate fleshy tube which is recurved upon the priapium and bends over to the anal side, where it terminates in a slight expansion; this is the penial structure proper, and at its end is the opening of the vas deferens.

Young males differ but little in general shape from females of the same size. The priapium begins as a very small fleshy ridge or outgrowth upon the throat; as it develops it extends backward, but not until it is almost fully developed do the external bones appear. With the appearance of the priapium the males seem to develop a well-defined and somewhat elongate neck; this is because the region in question does not increase in size while the great expansion of the priapium is taking place. The development of the priapium does not take place uniformly; some males will differ but little from females, while others of the same size will have the sexual organ half grown, and still others, no larger, will have it and its bones fully developed.

The color in alcohol is pale yellowish brown, with a thin black line along the side from above the pectoral base to the middle of the caudal fin; above this the scales are outlined by fine brown dots, these densest along the median dorsal region; brown specks are also scattered over the ventral half of the body in more or less evident longitudinal rows; above the base of the anal fin is a black line; the top of the head is more or less blackish or dark dotted; the lower lip and chin are dusky or specked with dark brown; the fins are all pale.

I have examined 35 specimens collected on May 18, 1924, in the creek at Santa Fe, Nueva Vizcaya Province, Luzon; 16 of these are males, from 19 to 35 millimeters in length, and 19 are females, from 22 to 41 millimeters long. None were in breeding condition.

Gulaphallus mirabilis[4] sp. nov. Plate 2, figs. 3 to 5.

First dorsal II; second dorsal I-6; anal I-16 or 17; there are 36 to 38 scales in a longitudinal series, 9 scales in a transverse series from the origin of the second dorsal to the hind end of the anal, and 16 scales from the origin of the second dorsal to that of the anal; there are 26 scales between the first dorsal and the scaleless region behind the head.

The general form of the head and body is like that of *Gulaphallus eximius;* in two female specimens, 30 and 32 millimeters long, the depth is contained 4.5 and 4.8 times in the length, the head 5.3 and 5.4 times, respectively; the eye is contained 3 times in the head, and 1.25 times in the interorbital space; the very short blunt snout is contained twice in the eye.

Three male specimens, 30, 31, and 32 millimeters long, have the depth contained from 4.6 to 5.3 times, the head from 5 to 6.4 times in the length; the snout, eye, and interorbital space are as in the females.

As may be seen by a comparison of the figures, the external bones of the priapium in *Gulaphallus mirabilis* are different in shape from those of *G. eximius.* The toxactinium of *mirabilis* is longer and slenderer, and its tip is more strongly curved than in the previously described species. The ctenactinium has an expanded scooplike tip, with extended sharp-pointed corners. The two bones unite at their bases, which form a continuous curve on the same side of the priapium. Within this curve, and therefore between them, arises the rather short fleshy tube which is the penislike structure, with the opening of the vas deferens in its tip.

I have examined 23 female specimens, from 25 to 32 millimeters in length, and 25 males, from 23 to 33 millimeters long. They were all collected at the mouth of the Ibo, a small mountain creek which flows into Angat River in Bulacan Province, about 60 kilometers northeast of Manila.

This species is easily separated from *Gulaphallus eximius* by the larger size and smaller number of the scales, and the differences in the appendages of the priapium. Some of the specimens collected in February are indistinguishable in development from the remainder, collected in September. As yet none have been found in breeding condition.

[4] *Mirabilis,* wonderful.

ILLUSTRATIONS

PLATE 1. GULAPHALLUS EXIMIUS SP. NOV., × 3

FIG. 1. Adult male, lateral view; *p*, penial structure; *c*, ctenactinium; *t*, toxactinium.

2. Adult male, head, ventral view.

FIGS. 3, 4, and 5. Stages in the development of the priapium; *a*, anus.

PLATE 2

FIG. 1. *Gulaphallus eximius* sp. nov., female, lateral view; *o*, oviduct; *a*, anus. × 3.

2. *Gulaphallus eximius* sp. nov., female, ventral view. × 3.

FIGS. 3, 4, and 5. *Gulaphallus mirabilis* sp. nov., male, head, right lateral, left lateral, and ventral views; *t*, toxactinium; *c*, ctenactinium; *p*, penial structure. × 3.

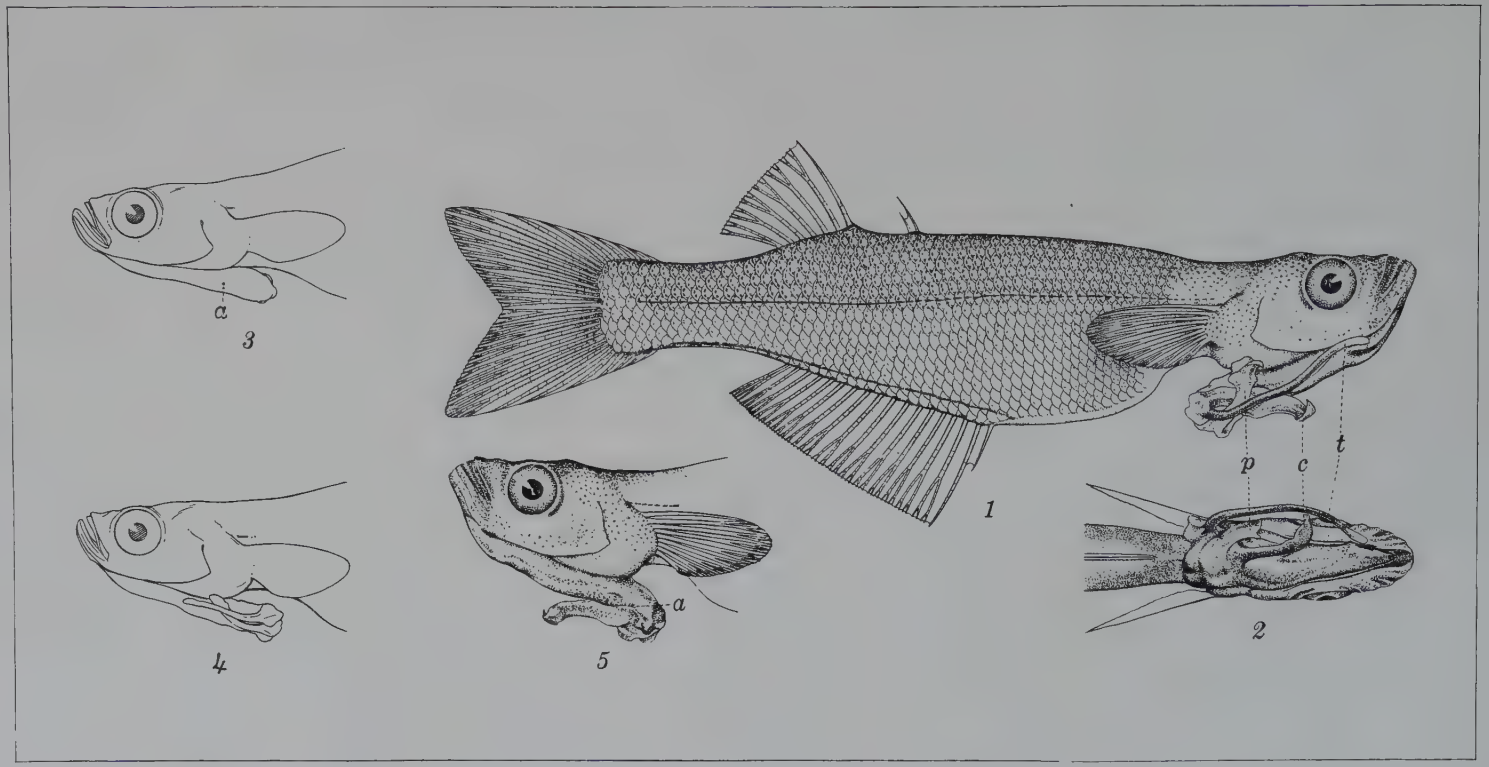


PLATE 1. GULAPHALLUS EXIMIUS SP. NOV.

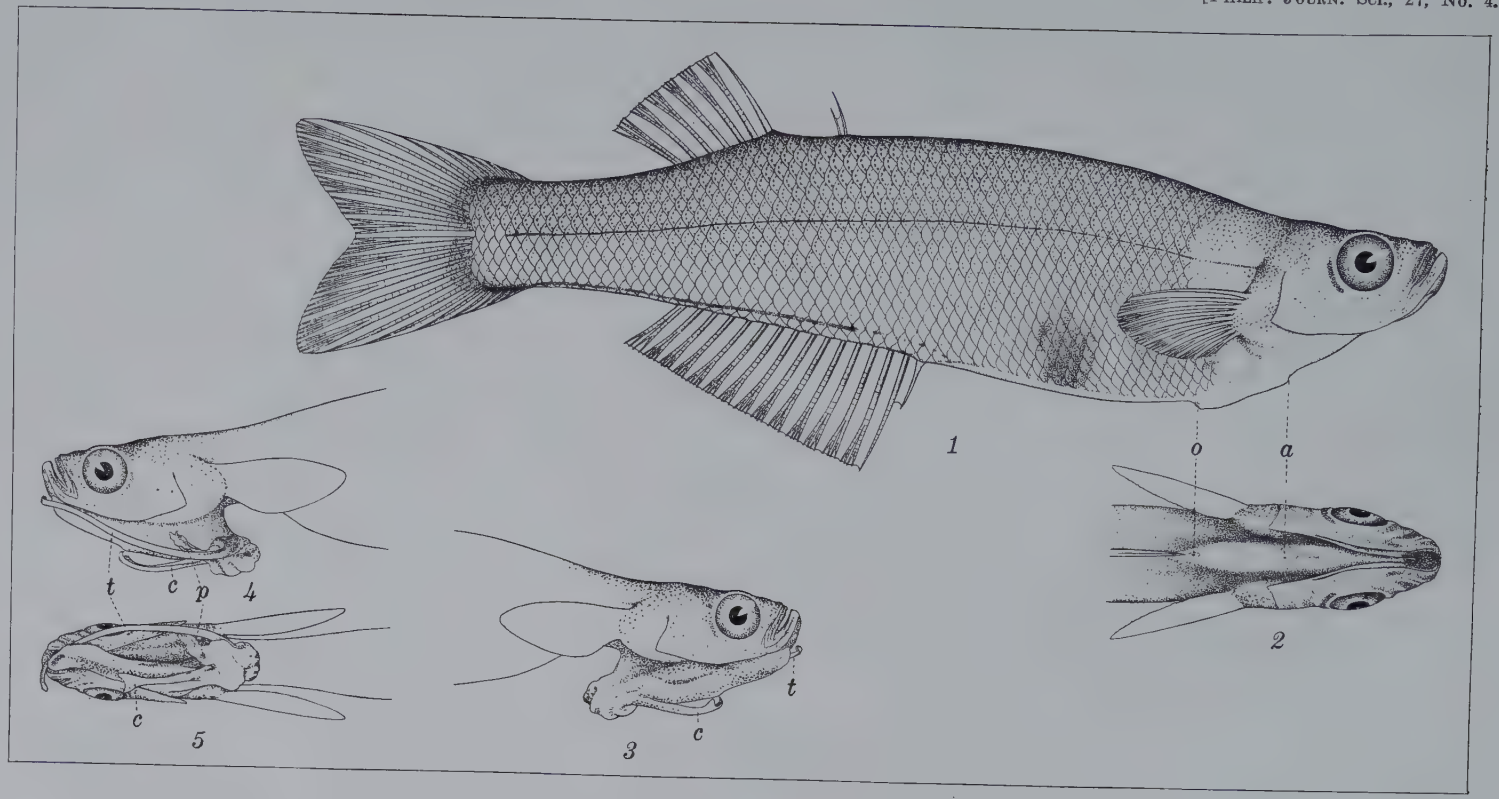


PLATE 2. GULAPHALLUS EXIMIUS SP. NOV. AND G. MIRABILIS SP. NOV.

ANTHICIDÆ OF THE PHILIPPINES, I

By H. Krekich-Strassoldo

Of Graz, Austria

THREE PLATES

To Dr. Charles Fuller Baker, dean of the College of Agriculture, University of the Philippines, I am indebted for a great number of Anthicidæ, sent me for study. The first results of my study of this material are presented herein.

I may mention that I have not yet seen specimens of *Notoxus* or *Mecynotarsus* from the Philippines, although these genera occur in Asia, and several species have been recorded from the Archipelago.

The genera *Formicomus* and *Anthicomorphus* are, however, well represented, and undoubtedly many more species will be discovered. It is very difficult to distinguish the species, especially in the genus *Formicomus,* in which occur many species very similar to the allied *Formicomus brahminus* Laferte which is common in southern Asia and the Sunda Islands. The difficulty is complicated by the fact that there are numerous local races. Therefore, it is absolutely necessary, in order to acquire exact knowledge of specific limits, to examine the genitalia minutely, especially in the males, and the anal segments of the abdomen. Unfortunately, it is often not possible to make such examinations unless a series of duplicate specimens is at hand. Therefore, some of this important work must be left to resident entomologists in the Philippines.

It appears that the Asiatic species of the genus *Formicomus* are very plastic and in a state of active evolution.

It is my opinion that the genus must be divided into two well-characterized subgenera. The connection of the neck with the head presents two conspicuous types. In some species the neck passes directly into the head, while in others the neck is apparently inserted on the underside of the head, leaving the base of the head free. The species under the first group are usually larger, and are more frequently inhabitants of the higher and mountainous districts, while those of the second

subgenus more commonly frequent the lowlands and coastal plains. The first subgenus, which I name *Orthauchen,* contains the following previously described species:

Formicomus aestimabilis Krekich-Strassoldo, Ent. Mitteil. Berlin 8 (1919) 168, from Trichonopoly in British India.

Formicomus himalayanus Krekich-Strassoldo, Verh. Zool. Bot. Gesellsch. Wien (1914) 109, from the Himalayas (Darjiling) 6,000 feet, September, and Kurseong, 5,000 feet, October.

Formicomus bhutanensis Pic, Bull. Soc. Ent. Fr. (1913) 204, from Bhutan (India).[1]

Formicomus angustipennis Pic, Echange 11 (1895) 9, from Borneo (Kinabalu), Banguey Island, and Java (Mount Pandan, near Surabaya).

Formicomus montanus Krekich-Strassoldo, Verh. Zool. Bot. Gesellsch. Wien (1914) 111, from Punjab, Kangra Valley, 4,500 feet, June, represents a passage between the two subgenera.

Genus **FORMICOMUS** Laferte

Subgenus **Orthauchen** novum

Formicomus bifasciatus Pic. Plate 1, fig. 1; Plate 2, fig. 1.

Formicomus bifasciatus Pic, Echange (1913) 131.

Pic, in describing *Formicomus borneensis,* added the following note:

J'ai recu recement en étude de M. Baker une espèce très voisine, recueille par leu à Los Baños (Philippines), qui a egalement deux bandes elytrales de pubescence blanche, mais qui se distingue par la tête retrecie posterieurement, la forme un peu plus allongée et la dent fine et pointue des cuisses anterieures; j'ai nomme cette espèce *bifasciatus.*

Since we now know that there are in the Philippines several species allied to *Formicomus bifasciatus,* it is necessary to complete Pic's description.

Elongate, elytra metallic blue, shining, thorax and head darker (often with a reddish brown reflection), thorax dull, especially on the disk.

Head elongate, suddenly narrowed behind the eyes which are very prominent; densely, transversely rugulose. The pubescence of the head consists of short, suberect bristlelike hairs in single transverse series, and of lighter, more-scattered erect hairs. Antennæ and legs dark brownish red, entirely covered

[1] The following species may, by the descriptions, belong also to the subgenus *Orthauchen: Formicomus lagenicollis* Fairmaire, Ann. Soc. Ent. Belg. (1894) 41, from Kurseong, Bengal; *F. latipennis* Pic, Echange (1914) 55, 56, from Sikkim; *F. longiceps* Pic, Bull. Soc. Ent. Fr. (1913) 204, from Mandi, India, and Hill States, Malaya.

with a dense, slender, whitish pubescence. Antennæ slender, reaching the shoulders, second joint very short, terminal joint longer than preceding and acuminate.

Thorax one and a half times as long as head, narrower than head with eyes, slightly constricted before base; lateral impressions not deep, densely punctured, pubescent on disk, scantily so on sides; two rounded impressions above basal margin smooth.

Elytra one and a half times as long as head and thorax together, widest at the middle. Shoulder decumbent and angulate, without postscutellar depression. With two bands of white hairs, the anterior band not reaching suture, the posterior band entire; behind the bands densely punctured and clothed with a dark, suberect, not dense pubescence; scutellum elongate, pointed, slightly impressed at middle.

Anterior thighs in the male with a long pointed spur. All tarsi strongly bristled.

Underside black, finely shagreened, mesosternum and prosternum smoother, scantily covered with whitish hairs. Near trochanters of mesosternum occurs a longer, yellowish pubescence.

Length, 5.6 millimeters.

LUZON, Laguna Province, Los Baños (*Baker*) : Cagayan Province, San Luis, Benguet Subprovince, Baguio (*Baker*).

Formicomus insignis nom. nov.

Formicomus maximus PIC, Melanges Exot. Ent. 36 (1922) 19.

Since Pic had previously described a specimen of *F. maximus* from Madagascar,[2] it becomes necessary to rename this species. It was described by Pic as follows:

♂. Elongatus, supra viridescens, capite strigoso, collo longo minuto; thorace satis elongato, parum robusto; elytris ad basin nitidioribus et sparse punctatis, antice griseo fasciatis, postice late griseo notatis; femoribus anticis breve dentatis, tibiis subsinuatus. Long. 8 mm.

Voisin de *F. bifasciatus* Pic, elytres en partie subopaques et pubescents vers l'extremité, cuisses antériores munies d'une dent courte et robuste.

One male specimen from Mount Banahao, Laguna Province (*Baker*), is probably this species; it differs from *F. bifasciatus* as follows:

Antennæ relatively longer and slenderer. Thorax with basal margin less shining and the two impressions above basal margin smaller and more approximated. Spur on anterior femora

[2] Bull. Soc. Ent. Fr. (1895) 378.

(male) not pointed, but abruptly shortened. Thorax more densely rugulose and without shining areas.

The anterior white hair band on elytra entire, and larger than in *F. bifasciatus*. The hairs forming the elytral bands are not pure white, but slightly shaded with brownish.

Length, 7.5 millimeters.

Unfortunately, the male genitalia have not been examined.

Formicomus albopictus sp. nov.

In form this species closely resembles *F. bifasciatus*, from which it differs in having only one anterior elytral band, which is formed by dense white hairs. Thorax lacking the two basal impressions of *F. bifasciatus* but, instead, with a longitudinal impression.

Length, 5.8 millimeters.

MINDANAO, Bukidnon Province, Tangkulan (*Baker*).

Formicomus bispinosus sp. nov. Plate 1, fig. 2; Plate 2, fig. 2.

Black, with a dark metallic blue reflection, moderately shining.

Head similar to that of *Formicomus bifasciatus*, but less suddenly narrowed behind eyes, which are very large and prominent; scantily covered with erect and suberect brownish hairs; punctures coarse and scattered. Antennæ longer and slenderer than in *F. bifasciatus;* terminal joint one and a half times the length of preceding joint.

Thorax strongly elevated anteriorly and then suddenly falling off to the collar; nearly as long as head; lateral impressions strong; a longitudinal furrow in the middle, divergent above basal margin, which is broad and not shining; puncturation and pubescence as on head, but more closely punctate and thickly pubescent in the furrow.

Elytra longer than head and thorax together, strongly expanded at middle, with scattering shallow punctures and sparse dark, erect hairs; two bands faintly indicated by a few whitish hairs.

Legs slender, dark brownish; anterior femora and tibiæ of very distinct configuration (Plate 1, fig. 2; Plate 2, fig. 2).

Underside black, finely granulate, scantily covered with brownish hairs. The visible anal segment in male has a double peduncle in the middle, of which the ventral one is in the form of a heel.

Length, 6.5 millimeters.

MINDANAO, Surigao (*Baker*).

Formicomus excavatus sp. nov. Plate 1, fig. 3.

Near to the species *F. brahminus* Laferte, *armatus* Boheman, *obscurus* Pic, etc., but very remarkable in having two broad, deep, bordered cavities on the anterior half of thorax. This is in no sense an abnormality, since the two cavities are internally clothed with specially arranged long stiff hairs.

Reddish brown. Throughout with hair-bearing punctures, the hairs erect.

Thorax strongly elevated above, with two large bordered cavities, and between the cavities an elevated carina; above the basal margin are two tuberculate elevations, beyond the elevations two deep pits.

Elytra broad with pointed shoulders, sparsely punctured, and shining.

Length, 3.7 millimeters.

MINDANAO, Dapitan (*Baker*).

Formicomus bakeri sp. nov. Plate 2, fig. 3.

In size and in form of neck very similar to *Formicomus bifasciatus* and *F. insignis,* but differing as follows:

General color dark brownish black, antennæ and legs a little brighter and with a reddish reflection.

Head densely rugulose, elytra finely shagreened, giving a general opaque appearance.

Thorax more globose, with a trace of a longitudinal impression in the middle; lateral impressions deep; above the basal margin densely transverse rugulose and with two shallow cavities.

Elytra sparsely covered with long, brownish, decumbent hairs and with few erect hairs.

Legs long and slender, femora clavate, anterior femora in male with a strong, short, acute spur, anterior tibiæ simple.

The form of the last abdominal segments is evident in Plate 2, fig. 3; the parameræ are inwardly shovel-formed.

Length, 6 millimeters.

LUZON, Nueva Vizcaya Province, Imugan (*Baker*).

Formicomus ambiguus sp. nov. Plate 2, fig. 4.

Between *Formicomus bifasciatus* and *F. bakeri,* but differing from both. Larger than *bifasciatus;* more similar to *bakeri* in size and in the dull appearance of the surface.

Elytra with a bronze greenish reflection. Thorax less globose than in *Formicomus bakeri,* with two small but deep

excavations above basal margin. Punctures of elytra very similar to those of *F. bakeri*. The band of white hairs on anterior third of elytra only feebly indicated; second band entirely absent. Spur of anterior femora of male acute, as in *F. bifasciatus*.

Length, 6 millimeters.

LUZON, Laguna Province, Mount Maquiling (*Baker*).

Subgenus **Formicomus** novum

Formicomus primitivus sp. nov. Plate 2, fig. 5.

A very interesting species, in that the male has simple anterior femora and tibiæ. This is a primitive character which until this time has been known in but two other species: *Formicomus vethi* Krekich-Strassoldo [3] from Sumatra, and *F. antiquus* Krekich-Strassoldo,[4] from Bengal. In *Formicomus primitivus*, besides other primitive characters, the terminal segments of abdomen are of simpler configuration than in other species.

Head, thorax, and legs dark reddish brown, elytra black with greenish and violet reflections.

Head longer than broad, narrowed behind; dull, with elevated punctures, from which spring bright stiff hairs. Eyes prominent, rounded. Antennæ slender, reaching the shoulders; all joints from the third to the eleventh of nearly same length.

Thorax elongate, narrower than head, very decumbent from the collar; lateral impressions very strong; basal margin narrow; slightly and irregularly punctured; before base densely transversely rugulose; clothed with scattered, short, not decumbent hairs and also with a few erect hairs. Thorax appears more shining than head.

Elytra elongate, base straight, shoulders pointed; scutellum oblong-pointed; no posthumeral impressions; no sutural margin; smooth, with but few punctures, regularly disposed; pubescence very thin and sparse.

Legs stout. Spurs of male femora replaced by many stiff hairs.

Length, 4.2 to 4.6 millimeters.

MINDANAO, Surigao (*Baker*).

[3] Wien. Ent. Zeit. (1914) 3. [4] Entom. Mitt. Berlin (1919) 172.

Formicomus simplex sp. nov. Plate 2, fig. 7.

As in the preceding species, the male of *Formicomus simplex* has simple anterior femora and tibiæ.

Body, legs, and antennæ reddish brown without metallic reflections, the surface rather dull.

Head nearly as long as broad, the base regularly arcuate, strongly rugulose, especially along eyes; disk with scattered coarse punctures; clypeus even; pubescence sparse and suberect; eyes less prominent; antennæ stout, reaching to the shoulders.

Thorax a little narrower than head with eyes, abruptly elevated from the collar; lateral impressions very large and deep; basal margin distinct; surface coarsely punctured, near base densely transversely wrinkled, and with scattered short, suberect hairs.

Elytra one and a half times as long as head and thorax together, broader in the middle; shoulders slightly decumbent and rounded; scutellum cordate; surface of elytra shining, covered with scattered coarse punctures and between these with very fine ones; pubescence short, stiff, yellowish.

Legs very short, the femora noticeably swollen.

Length, 4.6 millimeters.

MINDANAO, Davao (*Baker*).

Allied with *F. primitivus* but of different form, legs and antennæ stouter, prothorax broader, elytra without metallic luster, and conjunction of neck and head more visible.

Formicomus appendicinus sp. nov. Plate 1, fig. 4; Plate 2, fig. 6.

A very distinct species, having two spinose projections on the first ventral segment, a character previously known only in *Formicomus sphinx* Krekich-Strassoldo,[5] from Cairo.

General color dark brownish red, only the elytra with dark greenish reflection, and mouth lighter.

Head densely longitudinally rugulose and ribbed; clothed with separated stiff hairs; surface dull. Antennæ slender (3.3 millimeters); joints 3 to 11 of nearly the same length.

Thorax and elytra with very fine but not dense punctures and with a few setose punctures; before hind margin of thorax slightly rugulose.

Length, 8 millimeters.

LUZON, Rizal Province, Montalban Gorge. (Bureau of Science).

[5] Entom. Mitt. Berlin (1919) 171.

Formicomus longithorax sp. nov.

Long, slender, head and thorax together nearly as long as elytra; surface shining. Antennæ, mouth, and legs brownish red; head and thorax dark brown. Elytra dark brown, anteriorly with metallic blue reflections.

Head globose-elliptical, with scattering punctures, these dense and deep only along eyes; covered with sparse, decumbent, and also erect hairs; eyes moderately prominent. Antennæ slender, reaching to shoulder; terminal joint not longer than eleventh, acuminate.

Thorax one and a half times as long as and narrower than head, with very deep longitudinal depressions at sides; in front very sparsely punctured and transversely rugulose; pubescence sparse.

Elytra parallel; shoulders straight, but angles very rounded; surface very shining, covered with sparse deep punctures from which spring white decumbent bristlelike hairs; in the interspaces between these occur very fine punctures. Scutellum long, acuminate.

Legs very stout, all femora much swollen, densely white pubescent.

Underside brownish black; the trochanters yellowish brown; epimera nearly impunctate, strongly shining; metasternum densely shagreened and densely clothed with decumbent bristlelike hairs.

Length, 4.8 millimeters.

LUZON, Mount Maquiling (*Baker*).

Allied with *Formicomus robustipes* Pic from Mentawei, but slenderer and all femora more clavate.

Formicomus rösseleri Pic. Plate 3, fig. 10.

Formicomus rösseleri PIC, Mitteil. Naturhist. Mus. Hamburg (1907) 178.

This variable *Formicomus* is apparently composed of an innumerable congeries of local races, which however it is difficult to separate on exterior characters.

Pic described the species as follows:

Mediocriter elongatus, nitidus, griseo-pubescens, et pilis hirsutis ornatus, capite thoraceque rufus, elytris nigris, anterius rufo-fasciatus, antennis pedibusque pro majore parte nigris. Capite diverse punctato, postice attenuato et subarquato, oculis griseis; antennis gracilibus, nigris, articulis primis plus minusve rufis exceptis; thorace elongato, antice dilatato-rotundato, sparse punctato; elytris antice posticeque plus minusve attenuatis, apice subacuminatis, distincte et sparse punctatis; abdomine pectoreque

nigris; pedibus nigris, aliquot femoribus ad basin aut tarsis rufescentibus, femoribus anticis in ♂ fortiter dentatis. Long. 4-4.5 mm. Insula Luzon.

Mit *F. obscurus* Pic nahe verwandt, besitzt aber eine gestrecktere Form mit anderer Färbung. Kopf und Halsschild sind rötlich und die Flügeldeckenbinde ist deutlicher.

The color of the head and thorax is not at all constant. There are specimens from Luzon with the head and thorax very dark, and some have dark eyes.

The punctures of the elytra are very scattered and setose, the punctures arranged more or less longitudinally. The thorax is densely punctured, especially on the disk; toward the base the punctures become broad and deep.

BASILAN. LUZON, Laguna Province, Mount Maquiling (*Baker*).

Formicomus gratiosus sp. nov. Plate 2, fig. 8.

Allied with *Formicomus obscurus* Pic, *F. terminatus* Pic, and *F. rösseleri* Pic, a group widely diffused in the Malay Archipelago. As the exterior habitus of these species is very similar, they can be separated by only the most careful study; they may, however, be clearly distinguished by the configuration of the terminal abdominal segments and genitalia. In another paper [6] I emphasized the extreme importance of the study of these structures in any thorough study of the species of *Formicomus*.

Formicomus gratiosus is dark brown throughout, the head and thorax are a little lighter and with a reddish luster, and the elytra are darker with a light yellow band in the anterior third which does not reach the lateral margins.

Head as long as wide, moderately globose, base rounded; with scattered setigerous punctures bearing longer, erect, lighter hairs and finer, setigerous punctures bearing shorter, darker, suberect hairs. Eyes large, prominent. Antennæ long, reaching the shoulders, stout, joints 3 to 11 nearly of the same length, terminal joint one and a half times as long as eleventh and acuminate.

Thorax one and a half times as long as wide, anteriorly as wide as head with eyes, strongly excavated at sides before base; anteriorly sparsely, posteriorly more densely and deeply punctured; clothed with decumbent hairs.

Elytra elongate, less wide in middle, the shoulders decumbent and with visible corners; sparsely punctured and dotted with

[6] Entom. Mitt. Deutsch. Ent. Mus. 8 (1919) 166.

somewhat sparse, suberect, yellowish pubescence. Scutellum elongate, pointed, transversely impressed at middle; postscutellar impression shallow.

Legs, especially the clavate femora, very stout; anterior femora of male each with a stout and abrupt spur, the anterior tibia of this sex swollen at middle.

Underside brownish red, shining, finely not densely punctured, and clothed with fine, light hairs.

Length, 3.6 millimeters.

BASILAN (*Baker*).

Formicomus penangensis sp. nov. Plate 2, fig. 9.

Brownish red, shining, antennæ brighter, a bright yellow band in the anterior third of elytra.

Head elliptical, moderately globose, front even, with sparse fine punctures and a few stiff, bright yellow hairs. Eyes round, prominent, strongly facetted. Antennæ slender, joint 11 distally wider, terminal joint nearly one and a half times as long as the eleventh and narrower, conical, acuminate.

Thorax as long and as broad as head with eyes, before base strongly laterally excavate; punctures and pubescence sparse; above base transversely rugulose.

Elytra two and a half times as long as thorax; shoulders decumbent; wider at middle, apex acuminate; puncturation sparse; lightly clothed with bright yellowish, suberect, stiff hairs.

Legs stout; femora clavate, tibiæ and tarsi strongly bristled; anterior femora of male bluntly broadened on underside. Anterior tibiæ simple.

Underside a little lighter colored, shining, sparsely punctured, and pubescent.

Length, 3 millimeters.

PENANG (*Baker*).

Similar to *Formicomus obscurus* Pic, but a distinct species.

Formicomus infuscatus sp. nov. Plate 3, fig. 1.

Of moderate size and reddish brown throughout.

Head elliptical, base broadly rounded; with both coarse and fine punctures; clothed with decumbent pubescence and also having sparse, erect, stiff hairs. Eyes large, prominent.

Thorax elongate, as broad in the middle as head with eyes, and sharply laterally excavate before the doubly margined base; disk with coarse, longitudinally arranged setigerous punctures.

Elytra two and a half times as long as thorax, apex pointed, shoulders acute; no posthumeral impressions; with longitudinally arranged setigerous punctures and in addition with separated erect hairs.

Legs stout, all femora clavate; tibiæ darker colored. Anterior femora in male each with a truncate spur, anterior tibiæ of this sex swollen at middle, distally excavate on underside; base of tibiæ externally with a hair tuft.

Length, 3.5 millimeters.

MINDANAO, Bukidnon Province, Tangkulan (*Baker*).

Formicomus iliganensis sp. nov. Plate 3, fig. 2.

Robust, shining; head, antennæ, thorax, and legs dark red; elytra black, with a dark yellowish red band in anterior third.

Head moderately globose, nearly as broad as long, shining, with sparse setigerous punctures bearing stiff yellowish hairs; in addition, in front at all sides occur other simple erect hairs. Antennæ very long and slender, densely hairy.

Thorax elongate, shining, rounded at sides before middle, and here nearly as wide as head with eyes; disk with punctures in longitudinal series; pubescence similar to that on head.

Elytra shining, covered with sparse setigerous punctures bearing light yellowish, not decumbent hairs; posthumeral depression very pronounced and on side of yellowish red band.

Legs stout, especially all of the femora; all tibiæ and tarsi very densely hairy. Configuration of anterior legs in male very similar to those of *Formicomus infuscatus*.

Length, 4 millimeters.

MINDANAO, Lanao Province, Iligan (*Baker*).

Allied to *Formicomus infuscatus*, but stouter; head rounder and smoother; elytra with a depression on anterior third; no hair tuft on anterior tibiæ; and the last abdominal segments different.

Formicomus intrusus sp. nov. Plate 3, fig. 3.

Dark throughout, shining, with bronze greenish reflections; head and thorax almost black, antennæ dark brown, legs dark reddish brown.

Head elongate, nearly elliptical in outline, less globose, base rounded; with scattered coarse punctures and longitudinally rugulose; rather thinly clothed with short, dark, bristly hairs. Eyes moderately prominent. An elevated carina along the antennal socket at the inner side. Antennæ slender, reaching

nearly to shoulders, all joints except second and third of nearly the same length; terminal joint a little longer than eleventh, acuminate.

Thorax twice as long as broad, a little narrower than head with eyes, moderately rounded at sides, gradually narrowed toward base; lateral impressions moderate; disk sparsely, toward base more densely, punctured, and above base strongly transverse rugulose; anteriorly very thinly, posteriorly more densely, pubescent; all hairs fine and bright.

Elytra one and a half times as long as head and thorax together, scarcely wider at middle, shoulders straight with pointed corners; no posthumeral depression; with scattered large punctures; a transverse area in anterior third very finely densely punctured.

Legs stout; all tarsi with dense bristlelike hairs. The male with a truncate spur on inner side of anterior femora.

Length, 3.8 millimeters.

MINDANAO, Davao Province, Davao (*Baker*).

Similar to *Formicomus obscurus* Pic and *F. rösseleri* Pic; but, among other differences, without a yellowish transverse band on elytra.

Formicomus castaneus sp. nov. Plate 3, fig. 4.

Elongate; brown throughout, legs, mandibles, and antennæ, except in middle, a little brighter; in anterior third of elytra an indistinct reddish transverse band; entire body clothed with erect and suberect, moderately long, scattered hairs.

Head long-elliptical, sparsely punctured, partially finely shagreened. Eyes almost round, large, prominent. Antennæ very long, slender, all joints except second of nearly same length, second shorter than third; terminal joint longer than eleventh, conical, pointed.

Thorax one and a half times as long as head, a little narrower than head, before base moderately narrowed, and excavated at sides; surface finely and sparsely punctured, at middle and above basal margin densely shagreened.

Elytra as long as head and thorax together, strongly widened at middle, globose at sides; shoulders decumbent, their corners rounded; surface very sparsely and not coarsely punctured. No postscutellar impression.

Legs very stout, all tibiæ and tarsi strongly bristled; anterior femora of male strongly clavate and with a stout abrupt spur; anterior tibiæ of male swollen at middle.

Underside light brown, shining, feebly punctured, and pubescent.

Length, 4.5 millimeters.

MINDANAO, Lanao Province, Kolambugan (*Baker*).

Very similar to *Formicomus obscurus* Pic and *F. rösseleri* Pic.

Formicomus philippinensis Pic. Plate 3, fig. 5.

Formicomus philippinensis PIC, Melanges Exot.-Ent. Fasc. 4 (1912) 11.

A specimen from Iligan, Mindanao (*Baker*) seems to correspond to *Formicomus philippinensis,* described by Pic as follows:

Assez allongè, brillant orné d'une pubescence grise espacée, parsemée de poils dressés, finement pontué, parfois avec le milieu du prothorax marque de points assez gros, testacé, extrémité des antennes, élytres, abdomen et partie des paltes noirs. Tête un peu retrecie derrière les yeux, subarquée posterieurment dilaté en avant, élytres oblongs, subacuminés au sommet, à faible depression antérieure; pattes rousses avec les cuisses postérieures et les tibias plus ou moins foncés, ♂ cuisses antérieures munies d'une dent émoussee au sommet et tibias antérieures echancrés en dédans au sommet.

3.5 a 5 mm.

Mindanao, Philippines.

A placer près de *F. pygidialis* Pic.

Formicomus lucidus sp. nov. Plate 3, fig. 6.

Black, shining, only bases of legs, antennæ, and palpi reddish. A somewhat obscure reddish band on anterior third of elytra.

Head round, as long as wide, base very rounded, moderately globose, in front with sparse elevated setigerous punctures, behind ordinary sparse punctures bearing light yellow hairs. Eyes large, almost round, rather prominent; at inner side of eyes along antennal socket, an elevated carina. Antennæ reaching the shoulders, all joints except second and tenth of same length, terminal joint a little longer, pointed.

Thorax one and a half times as long as wide, in front as wide as head with eyes, strongly widened in anterior portion, narrowed before base where it is moderately impressed at sides; on disk and near base more densely punctured and pubescent; base with deep double margin, shining.

Elytra elongate, shoulders decumbent, pointed. No postscutellar impression, surface with scatttered setigerous punctures from which rise decumbent as well as erect whitish hairs, and among these punctures numerous finer punctures.

Anterior femora of male with a strong abrupt spur. At base of anterior tibiæ externally occurs a tuft of white hairs, and a stiffer tuft at inner side of end of anterior tibiæ.

Underside shining, sparsely punctured and pubescent.

Length, 3.25 millimeters.

LUZON, Laguna Province, Los Baños (*Baker*).

Similar to *Formicomus obscurus* Pic and *F. rösseleri* Pic.

Formicomus lucidulus sp. nov. Plate 3, fig. 7.

Small, very shining, dark brownish black, the antennæ, mouth, all femora, and distal joints of tarsi lighter reddish brown; end of elytra translucent reddish brown.

Head oval; along antennal sockets with anteriorly converging carinæ; surface with scattered coarse and fine punctures, above eyes with setigerous punctures horizontally arranged; with scanty scattered yellowish hairs. Antennæ very long, second joint a little shorter than third; terminal joint longer than eleventh, acuminate.

Thorax oblong, narrower than head, nearly smooth at sides, more stoutly punctured on disk, the punctures very deep above base; pubescence very scanty, thin, short.

Elytra nearly three times as long as thorax, very shining; shoulders acute; puncturation and pubescence very sparse; post-scutellar impression feebly indicated, scutellum heart-shaped, feebly excavate at middle.

All femora clavate and all tibiæ and tarsi densely bristled. Anterior femora of male with a short, strong, acuminate spur.

Length, 3.6 millimeters.

Philippines.

I possess also two females and a defective male of a similar *Formicomus*, from Manila. These appear to be of a brighter color, with a less distinct yellow band at anterior third of elytra. The pubescence is longer and denser. I am not certain that these specimens belong to *lucidulus*, not being able to examine the male genitalia. They may represent a form of *F. manillanus* Pic.

Formicomus microphthalmus sp. nov. Plate 1, fig. 5; Plate 3, fig. 8.

This species is remarkable by reason of the very small eyes.

Elongate, red brown throughout, with a transverse yellow band on anterior third of elytra. Tips of mandibles black, shining.

Head oval; puncturation scanty and scattered; clothed with a few, soft, light hairs. Eyes very small, nearly round, not prominent, distant from origin of antennæ.

Thorax longer and broader than head, remarkably narrowed at sides before base; pubescence similar to that of head; puncturation scanty, not strong, becoming denser and somewhat rugulose above base.

Elytra narrow, nearly parallel; with scattered setigerous punctures bearing yellowish hairs.

Legs stout, long, anterior femora of male with a truncate spur on inner side; anterior tibiæ of male swollen at middle; base of tibiæ externally with a hair tuft.

Length, 4.5 millimeters.

LUZON, Laguna Province, Mount Maquiling (*Baker*).

Formicomus niger Pic.

Formicomus niger PIC, Le Naturliste 18 (1896) 171.

Doctor Baker has sent me, from Surigao, Mindanao, a *Formicomus* very similar to *F. niger* described by Pic from Cooktown, Australia. Unfortunately, the four specimens sent are all females. It is impossible to decide the matter definitely without examining the peculiar characters of the males.

Formicomus parvulus sp. nov. Plate 3, fig. 9.

Small; brownish black, only the legs brighter; scarcely shining.

Head elliptical, the base regularly rounded, longer than broad, finely, not densely punctured, the punctures becoming coarser anteriorly; finely shagreened throughout; rugulose about eyes and mouth; pubescence scanty, decumbent; eyes small, not prominent, finely bordered. Along the antennal socket a small elevated carina, directed forward. Antennæ slender, terminal joint one and a half times as long as eleventh, conical.

Thorax one and a half times as long as broad, a little narrower than head with eyes, slightly narrowed before base; puncturation and pubescence similar to that of head; above base punctures stronger and transverse rugulose.

Elytra one and a half times as long as head and thorax together, scarcely wider at middle; base straight, shoulders a little decumbent, with acute corners; finely punctate and shagreened; covered with sparse, dark, decumbent hairs which indicate a transverse band in the moderate postscutellar impression; su-

tural margin moderately elevated. Scutellum oblong, heart-shaped, not impressed.

Legs moderately stout.

Underside dark brown, finely shagreened and punctate, scantily pubescent.

Length, 2.5 millimeters.

LUZON, Laguna Province, Los Baños (*Baker*).

The terminal segment of abdomen has a moderately elevated peduncle in the middle.

Macrotomoderus ruficolor Pic. Plate 1, fig. 6.

Macrotomoderus ruficolor PIC, Echange (1910) 52.

One specimen sent by Doctor Baker from Surigao, Mindanao, is evidently this species, described from Banguey Island.

Prothorax distinctement échancré-entaillé dans sa partie étranglée, à ponctuation non rugulose et écartie, au moins sur sa partie antérieure: tête moins grosse, non, ou à peine plus large que le prothorax; second article des antennes tres court, subtransversal. Entaillé du prothorax très marquée et lobe postérieur presque lisse sur la base; avant-corps plus robuste avec la tête à peine arquée en arriére; coloration gènèrale rousse.

6 mm.

Tomoderus bakeri sp. nov. Plate 1, fig. 7.

Very small; light brown, with an indistinct darker spot in middle of elytra.

Head transverse, base straight with rounded corners. Eyes small, not prominent. Antennæ moderately long, the last five joints larger and transverse.

Thorax elongate, the anterior lobe narrower than the head; impression between anterior and posterior lobes moderately strong.

Puncturation and pubescence of head and thorax insignificant.

Elytra twice as long as head and thorax together, shoulders recumbent; surface regularly and moderately deeply punctured.

Length, 2.2 millimeters.

LUZON, Laguna Province, Los Baños (*Baker*).

Tomoderus fumeoalatus sp. nov.

Dark reddish brown, only the first and second and two or three terminal joints of antennæ, the tibiæ, tarsi, and palpi testaceous.

Head transverse, densely and finely punctured and finely pubescent. Eyes less prominent. Antennæ slender, very hairy terminal joint pointed.

Thorax very elongate, the anterior lobe as wide as head with eyes, posterior lobe of equal width only at base; cavity between anterior and posterior lobes broad and more densely and finely punctured than rest of thorax.

Elytra short, half again as long as wide, moderately globose; shoulders straight with pointed corners; surface with somewhat longitudinally arranged punctures which become coarser anteriorly; covered with dense, suberect, and scattered erect, whitish hairs. Wings darkened.

Legs moderately stout.

Length, 2.8 millimeters.

MINDANAO, Dapitan (*Baker*).

Genus **ANTHICOMORPHUS** Lewis

Anthicomorphus LEWIS, Ann. & Mag. Nat. Hist. VI 15 (1895) 428.

This genus is distinguished, superficially, from *Anthicus* by the very large eyes, especially in the middle, and by the long thick antennæ which have a very long terminal joint.

Anthicomorphus (Walesius?) rufus sp. nov. Plate 1, fig. 8.

Reddish brown throughout, except the antennæ, of which joints 4 to 12 are dark brown.

Head trapezoidal, base pointed and extended; densely, finely, regularly punctured; in front with longer, light brown, bristle-like hairs, elsewhere with only simple erect hairs. Eyes very large, of irregular shape, excavate above, coarsely facetted.

Thorax elongate, narrower than head; lateral impressions strong; finely, shallowly, rather densely punctured; clothed with a thin, irregular pubescence, which becomes more dense in the lateral impressions.

Elytra very elongate, nearly parallel, with a very distinct postscutellar impression; lateral margins feebly elevated, sutural margin not; puncturation similar to that of thorax; clothed with fine, light yellow, decumbent hairs. Scutellum heart-shaped.

Legs slender, femora moderately elevated, the tibiæ on inner side densely bristled.

Underside brownish red, shining, uniformly clothed with fine, yellowish, decumbent hairs, which extend beyond the segments, forming little fringes.

Length, 6 millimeters.

MINDANAO, Agusan Province, Butuan (*Baker*).

This species, judging from the description,[7] seems to be very similar to *Walesius theresae* Pic, but I believe the present species to be distinct, because the author does not mention the unusual size of the eyes, and because in our species the eleventh antennal joint is not transverse.

It can be left to later study to decide if it be justifiable to separate *Walesius* as a distinct genus.

Anthicomorphus rufescens sp. nov.

Similar to *Anthicomorphus rufus* in color, but smaller and relatively stouter. Also differing as follows:

Base of head not elongate and pointed, but feebly excavate medially. Eyes straight anteriorly. Antennæ less slender, reaching shoulders; joints 4 to 10 darkened, the terminal joint two and a half times as long as eleventh. Puncturation a little denser and less deep than in *A. rufus*.

Thorax relatively broader than in *Anthicomorphus rufus* and very densely, deeply rugulose punctate, and therefore not shining. Pubescence throughout shorter, denser, and more decumbent.

Length, 3.4 millimeters.

MINDANAO, Agusan Province, Butuan (*Baker*).

Although the females of the genus *Anthicomorphus* are very different from the males, I believe the two female specimens now concerned cannot be the female of *A. rufus*, since the differences in size, puncturation, pubescence, etc., are too great.

Anthicomorphus infuscatus sp. nov. Plate 1, fig. 9.

Very similar to the preceding, but probably specifically distinct.

Darker reddish brown; head and thorax darker than elytra; also the antennæ, of which only the first and the apex of terminal joint appear a little lighter. Legs brownish red, the tibiæ of the male darkened in the middle.

As in *Anthicomorphus rufescens*, the head of the female at base is moderately medially excavate, that of the male straight. The thorax is more deeply and coarsely punctured in the female than in the male.

Length, 4.5 millimeters.

MINDANAO, Surigao Province, Surigao (*Baker*).

[7] Le Naturliste 18 (1896) 184.

Anthicomorphus fumeoalatus sp. nov.

Superficially resembles *Anthicomorphus infuscatus*, but differs from it as follows:

Form slenderer; general color black to reddish brown, but the elytra darker colored than the head and thorax. Wings dark infumate.

Sutural margin broad in apical part of elytra and apically more impressed than in allied species.

Thorax covered with dense, short, decumbent pubescence, and also with some longer, erect hairs.

Length, 3.5 to 4 millimeters.

MINDANAO, Agusan Province, Butuan: Lanao Province, Iligan (*Baker*).

Anthicomorphus consimilis sp. nov.

Very similar to *Anthicomorphus infuscatus*, but smaller and darker, and pubescence less dense. Elytra apically with erect stiff hairs, which are lacking in *A. infuscatus*. Base of head straighter. Terminal joint of antennæ longer and slenderer. Prothorax narrow and more decumbent, from neck toward middle.

Length, 3.3 millimeters.

MINDANAO, Surigao Province, Surigao (*Baker*).

Anthicomorphus montanus sp. nov.

Small; dark brown throughout, only the tarsi lighter; puncturation dense and deep, denser on head than on thorax, on thorax also rugulose; clothed with long, dense, decumbent, yellowish hairs; also with separated, stiff, erect hairs.

Head transverse, base nearly straight; eyes prominent but comparatively not large, kidney-shaped, anteriorly not excavate. Antennæ slender, the terminal joint in male very long and acuminate, in female shorter and more obtuse.

Neck long. Thorax narrower than head; lateral impressions deep.

Elytra more elongate in male than in female; shoulders straight; postscutellar impression transverse, very deep. No sutural margin. Wings infumate.

Legs slender, femora less clavate.

Length, 3 to 3.2 millimeters.

LUZON, Laguna Province, Mount Maquiling and Mount Banahao (*Baker*).

A female from Mount Banahao is somewhat stouter.

Anthicomorphus glaber sp. nov.

Similar in size to *Anthicomorprus montanus*, but reddish brown throughout (the thorax a little darker), shining, anterior part of thorax more decumbent at sides, elytra more finely punctured, wings less darkened. Puncturation of head and elytra fine, not dense, that of thorax dense and deep. Scarcely pubescent.

Head transverse, moderately globose. Eyes small, less prominent, feebly kidney-shaped. Antennæ slender, second joint very short.

Thorax with deep lateral impressions.

Elytra with a deep transverse impression on anterior third.

Length, 3 millimeters.

LUZON, Laguna Province, Mount Maquiling (*Baker*).

Anthicomorphus atronotatus Pic.

Anthicomorphus atronotatus PIC, Melanges Exot.-Ent. 36 (1922) 18.

The author describes this species as follows:

Oblongus, nitidus, mediocre punctatus et parum pubescens, rufus, antennis nigris, ad basin et apice rufis: thorace rufo, in disco nigro notato, parum elongato; elytris rufis, ad basin et ad medium nigro notatis, antice sat fortiter depressis.

Long. 3 mm. Luzon.

Voisin de *sulcatipennis* Pic plus allongé et elytrés macules de foncé.

LUZON, Laguna Province, Mount Maquiling (*Baker*), one specimen.

Anthicomorphus sulcatipennis Pic.

Anthicomorphus sulcatipennis PIC, Melanges Exot.-Ent. 13 (1915) 8.

I have not seen this species, and the description is so general that it can apply to almost any small-sized *Anthicomorphus*.

The description given is as follows:

Parum elongatus, nitidus, luteo-pubescens et griseo hirsutis, rufus, oculis antennisque, articulis primis rufis exceptis, nigris; antennis validis; capite lato, postice arcuato; thorace elongato, postice impresso, fortiter et dense punctato; elytris satis brevibus, minute et sparse punctatis, ad basin valde impressis.

Long. 3 mm. Iles Philippines.

Peut se placer pres de *A. niponicus* Lewis, dont il diffère par la forme, moins allongée, les elytrés fortement impressiones en avant et la coloration.

ILLUSTRATIONS

PLATE 1

FIG. 1. *Formicomus bifasciatus* Pic; *a*, male, dorsal view; *b*, head and thorax, lateral view.
2. *Formicomus bispinosus* sp. nov.; *a*, male, dorsal view; *b*, head and thorax, lateral view.
3. *Formicomus excavatus* sp. nov.; *a*, female, dorsal view; *b*, head and thorax, lateral view.
4. *Formicomus appendicinus* sp. nov.; *a*, male, dorsal view; *b*, head and thorax, lateral view; *c*, abdomen, ventral view.
5. *Formicomus microphthalmus* sp. nov.
6. *Macrotomoderus ruficolor* Pic.
7. *Tomoderus bakeri* sp. nov.
8. *Anthicomorphus rufus* sp. nov.; *a*, male, dorsal view; *b*, head and thorax, lateral view.
9. *Anthicomorphus infuscatus* sp. nov., head and thorax; *a*, male, dorsal view; *b*, lateral view; *c*, female, dorsal view.

PLATE 2

[Legend: *st*, visible last sternite; *stl*, same as *st*, lateral view; *s*, interior final segments; *a*, visible last tergite; *p*, penis; *at*, anterior thigh.]

FIG. 1. *Formicomus bifasciatus* Pic.
2. *Formicomus bispinosus* sp. nov.
3. *Formicomus bakeri* sp. nov.
4. *Formicomus ambiguus* sp. nov.
5. *Formicomus primitivus* sp. nov.
6. *Formicomus appendicinus* sp. nov.
7. *Formicomus simplex* sp. nov.
8. *Formicomus gratiosus* sp. nov.
9. *Formicomis penangensis* sp. nov.

PLATE 3

[Legend: *st*, visible last sternite; *s*, interior final segments; *sd*, same as *s*, dorsal view; *a*, visible last tergite; *p*, penis; *fs*, female styli.]

FIG. 1. *Formicomus infuscatus* sp. nov.
2. *Formicomus iliganensis* sp. nov.
3. *Formicomus intrusus* sp. nov.
4. *Formicomus castaneus* sp. nov.
5. *Formicomus philippinensis* Pic.
6. *Formicomus lucidus* sp. nov.
7. *Formicomus lucidulus* sp. nov.
8. *Formicomus microphthalmus* sp. nov.
9. *Formicomus parvulus* sp. nov.
10. *Formicomus rösseleri* Pic.

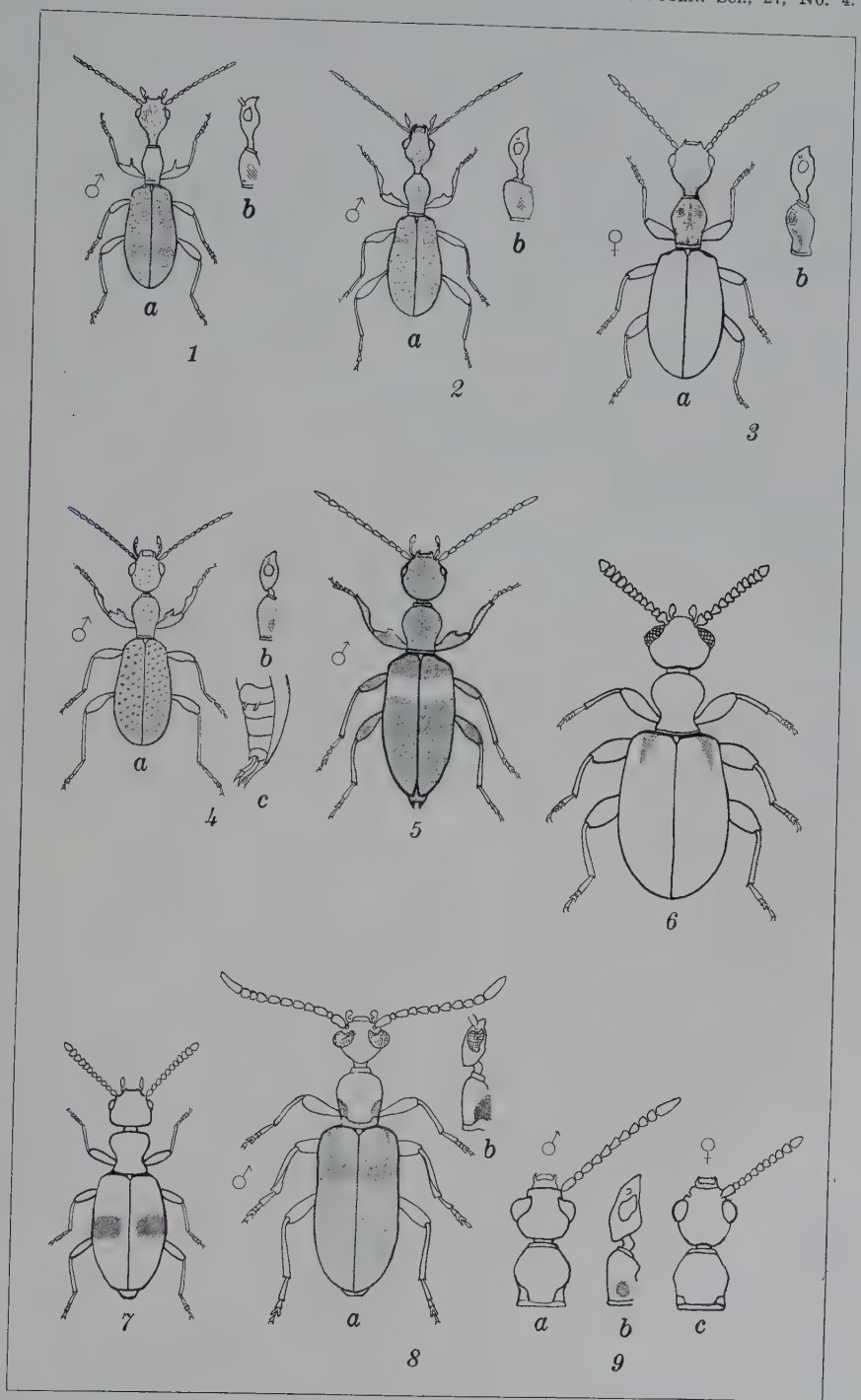


PLATE 1.

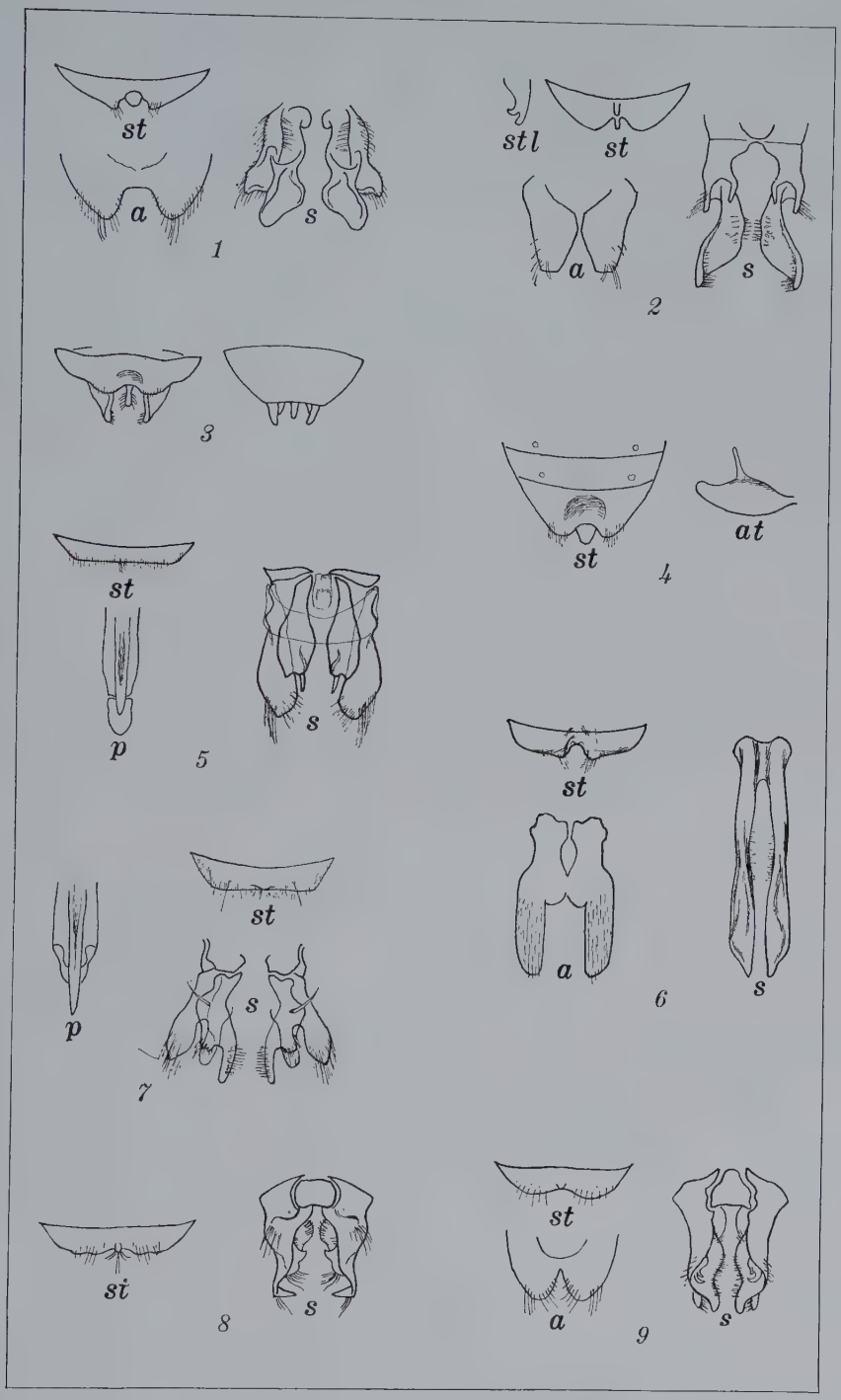


PLATE 2.

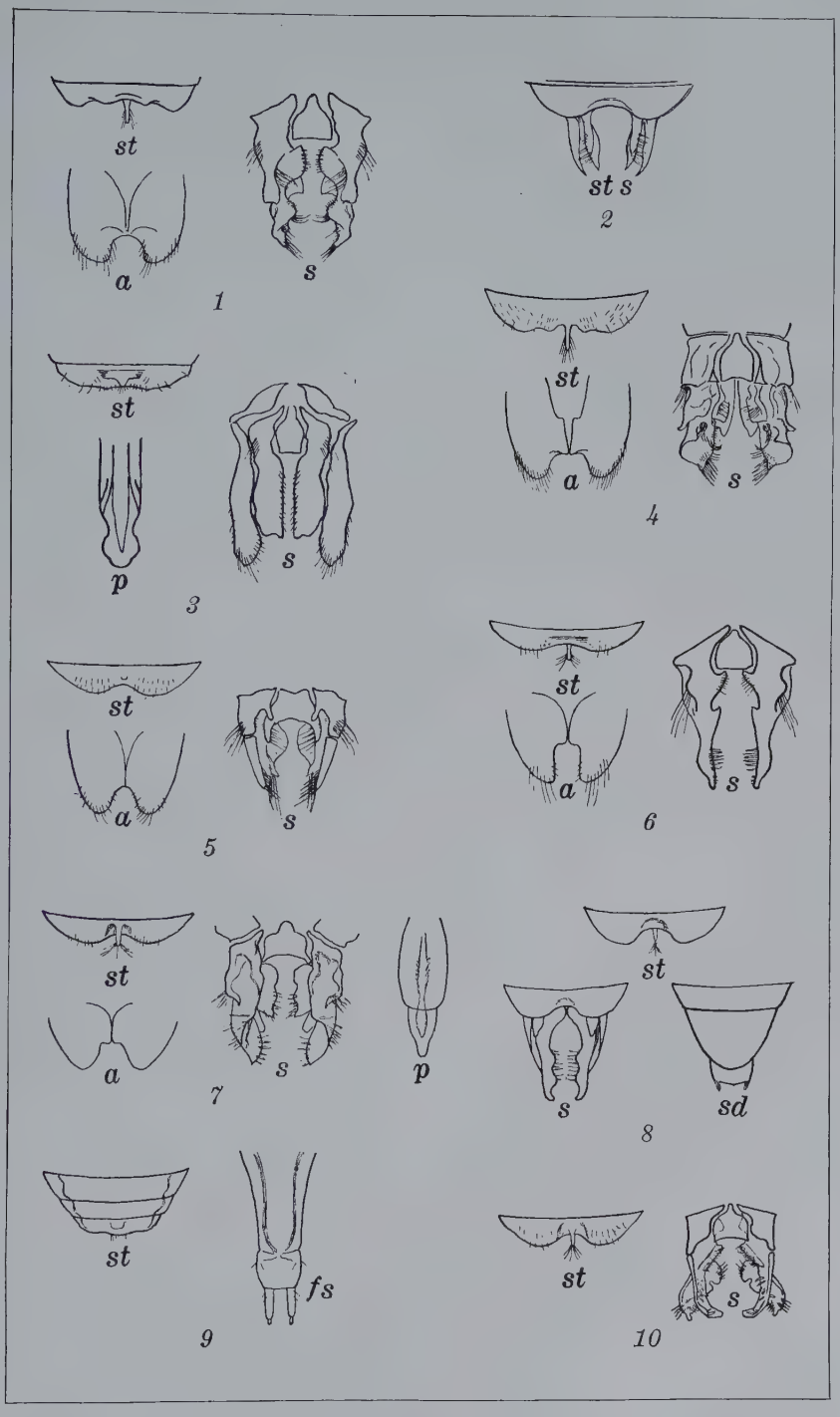

st
a
1
s
st s
2
st
p
3
s
st
a
4
s
st
a
5
s
st
a
6
s
st
a
7
s
p
st
s
sd
8
st
fs
9
st
s
10

PLATE 3.

NOMENCLATORIAL NOTES ON THE JASSOIDEA, IV

By C. F. Baker

Dean, College of Agriculture, Los Baños, Laguna

The following new names are suggested for species of Jassoidea:

Athysanus harrarensis nom. nov. for *Athysanus similis* Melichar 1911, not *Athysanus similis* Kirschbaum 1868.

Athysanus kumaonis nom. nov. for *Athysanus coronatus* Distant 1918, not *Athysanus coronatus* Bergroth 1879.

Deltocephalus distanti nom. nov. for *Deltocephalus capitatus* Distant 1918, not *Deltocephalus capitatus* Matsumura 1908.

Deltocephalus ceylonensis nom. nov. for *Deltocephalus bimaculatus* Melichar 1903, not *Deltocephalus bimaculatus* Gillette and Baker 1895.

Deltocephalus matsumuri nom. nov. for *Deltocephalus littoralis* Matsumura 1908, not *Deltocephalus littoralis* Ball 1905.

Deltocephalus fraternellus nom. nov. for *Deltocephalus fraternus* Matsumura 1915, not *Deltocephalus fraternus* Ball 1911.

Erythroneura apacha nom. nov. for *Erythroneura bipunctata* Gillette 1898, not *Erythroneura bipunctata* Melichar 1896.

Erythroneura kansana nom. nov. for *Erythroneura scutellaris* Gillette 1898, not *Erythroneura scutellaris* Herrich-Schaeffer 1834.

Erythroneura lawsoni nom. nov. for *Erythroneura dorsalis* Gillette 1898, not *Erythroneura dorsalis* Horvath 1897.

Typhlocyba froggatti nom. nov. for *Typhlocyba australis* Froggatt 1918, not *Typhlocyba australis* Walsh 1864.

Typhlocyba dubiosa nom. nov. for *Typhlocyba dubia* Distant 1918, not *Typhlocyba dubia* Fieber 1884.

Naturally, subsequent generic changes may render some of these new names unnecessary, but the species affected cannot stand in the catalogue of to-day in this form. Any previous changes of these names are unknown to me.

DIE TENEBRIONIDEN (COLEOPTERA) DES INDO-MALAYISCHEN GEBIETES, UNTER BERUECKSICHTIGUNG DER BENACHBARTEN FAUNEN, VII

DIE GATTUNG PLATYDEMA CASTELNAU UND BRULLE

Von Hans Gebien

Hamburg, Deutschland

EINE TAFEL

Genus **PLATYDEMA** Castelnau und Brulle [1]

Die Gattung *Platydema* unfasst schon jetzt über zweihundert beschriebene Arten, und es kann nicht zweifelhaft sein dass diese Zahl hinter derjenigen der wirklich existierenden weit zurückbleibt, selbst wenn auch eine grössere Zahl von Arten in neue Gattungen gestellt werden sollte. Es kann nicht wundernehmen dass verschiedene Forscher versucht haben die Gattung aufzuteilen, oder grosse Artkomplexe zu neuen Gattungen zu erheben; leider haben sich bis jetzt keine durchgreifenden Merkmale gefunden. Motschulsky hat auf die matten Arten die Gattung *Neomida* gegründet, die ganz unhaltbar ist; sie umfasst einfarbige und gezeichnete Arten, solche bei denen der Kopf beim Männchen gehörnt, und solche bei welchen der Kopf in beiden Geschlechtern einfach ist; auch Arten welche "subopaque" sind finden sich in der Gattung. Chevrolat stellt die Gattung *Histeropsis* auf. Ich möchte mir nicht versagen die unglaubliche Beschreibung hier wiederzugeben:

Le genre que je propose, *Histeropsis*, renfermera un grand nombre d'espèces plus ou moins noires, lisses, pointillées, granuleuses, de forme allongée, légèrement convexes, offrant sur chaque etui 9 stries entières et un 10. scutellaire, courte.

Im Gegensatz dazu heisst die Beschreibung von *Platydema:*

Les *Platydema* seront faciles à reconnaitre par leur surface ordinairement cotonneuse, leur forme semi-orbiculaire, arrondie ou allongée.

Zu *Histeropsis* sollen also mehr oder minder glatte, schwarze, granulierte Arten gehören; Chevrolat stellt aber bunt gezeich-

[1] Ueber die umfangreiche Literatur siehe Gebien, Col. Cat., pars 28 (1911) p. 370.

nete Arten hinein; ich kenne keine einzige granulierte Art. Zu *Platydema* sollen behaarte (wenn ich "cotonneux" richtig übersetze, es bedeute doch wollig, bepelzt) Arten gehören, die es bei *Platydema* überhaupt nicht gibt. Vermutlich will der Autor nur die beiden Gruppen unterscheiden: (1) Glatte, das heisst, mehr oder minder blanke, und (2) matte Arten. Eine Grenze zu ziehen ist ihm aber nicht möglich; das mag für einzelne Faunengebiete durchzuführen sein, zum Beispiel, bei unsern indo-malayischen Arten, aber Gattungsmerkmale sind das nicht.

Man könnte versucht sein, die Gattung darnach aufzuteilen, ob die Männchen einen gehörnten oder tuberkulierten, oder ganz einfachen Kopf haben. Auch da stösst man auf Schwierigkeiten. Es gibt Arten bei denen das Männchen ein paar winzige rundliche Tuberkeln hat, die kaum sichtbar sind (zum Beispiel, *P. velutinum*); in welche Gruppe sind die zu stellen? Diese Körnchen sind der Anfang einer Hornbildung, die über scharfe Tuberkeln, vorspringende Ecken zu langen Hörnern führt. Gehörnte und ungehörnte Arten finden wir sowohl bei der Gruppe mit bunter Oberseite als auch bei den metallischen und den mattschwarzen Arten, wieder ein Beweis dafür, dass dieses in die Augen springende Merkmal nicht von generischem Wert ist.

Am ehesten liessen sich vielleicht die mattschwarzen Arten abtrennen, weil die Hinterecken des Halsschildes nicht durch die sonst vorgezogene Basis abgeschrägt werden, und weil die meisten dahin gehörigen Arten beim Männchen ein erweitertes erstes Glied an den Vordertarsen haben. Aber die zahlreichen mattschwarzen Arten aus Amerika sínd wieder abweichend.

Eine Beschreibung der Gattung dürfte, weil sie vielfach recht ausführlich versucht wurde, überflüssig sein.

Ich habe die indischen Arten in drei Gruppen geteilt, die mir natürliche zu sein scheinen:

1. Gezeichnete, oder doch wenigstens oben nicht einfarbige Tiere, die nie metallisch sind.
2. Metallische oder blanke, schwarze Arten.
3. Arten mit mattschwarzen Flügeldecken.

Die erste Gruppe ist nach der Bildung des Kopfes beim Männchen wieder in natürliche Abteilungen zu teilen, wie folgt:

a. Männchen und Weibchen ungehörnt und nicht tuberkuliert.
b. Kopf des Männchens mit einen einzelnen, konischen Horn.
c. Kopf des Männchens asymmetrisch; das linke Horn ist grösser.
d. Kopf des Männchens asymmetrisch; das rechte Horn ist grösser.

e. Kopf des Männchens symmetrisch, mit zwei gleichen Hörnern.
f. Kopf des Männchens symmetrisch, mit einem Gabelhorn.

Bestimmungstabelle für die asiatischen Platydema-Arten.

Körper zylindrisch, Oberseite einfarbig glänzend braun, Männchen mit zwei gleichlangen konischen Hörnern. (Burma.)
P. ferrugineum (Motschulsky).

Körper oval, Oberseite niemals einfarbig glänzend braun ..... 1.

1. Flügeldecken nicht einfarbig, meist gezeichnet, gefleckt, oder doch mindestens mit hellen Rand, nie metallisch, nie mattschwarz[2] ..... 2.
Flügeldecken metallisch oder einfarbig schwarz oder braun ..... 2.
2. Kopf in beiden Geschlechtern ungehörnt ..... 3.
Kopf beim Männchen gehörnt ..... 9.
3. Die Wangen haben Augenbreite, Fühler mit sechs erweiterten Gliedern; Decken mit drei gezackten schwarzen Binden. (Formosa.)
P. flavopictum Gebien.
Die Wangen sind viel schmäler als die Augen; Fühler mit acht erweiterten Gliedern; Decken mit anderer Zeichnung ..... 4.
4. Körper auffallend flach parallelseitig; die schwarzen Flügeldecken mit je zwei sehr grossen gelben Flecken; die beiden ersten Abdominalsegmente beim Männchen mit Haarfleck ..... 5.
Körper gewölbt, oval; die hellen Flügeldecken mit schwarzen Binden, die an der Naht meistens verbunden sind; Abdomen des Männchens ohne Haarflecken ..... 6.
5. Unterseite rotbraun; Halsschild auf mehr als die Endhälfte parallel; 6 Millimeter gross. (Mentawei.) ..... **P. pilosiventre** sp. nov.
Unterseite schwarz; Halsschild auf ein Drittel der Länge parallel; 5 Millimeter gross. (Borneo.) ..... **P. planum** Gebien.
6. Das Prosternum ist hinten deutlich niedergebogen; Vorderkörper durch sehr dichte und feine Punktierung matt; Stirn breiter als ein Auge. Sehr weit verbreitet (*sodale* Waterhouse.) ..... **P. pallidicolle** Lewis.
Prosternum hinten ganz wagerecht; Vorderkörper blank, weitläufig punktiert; Stirn so breit oder schmäler als ein Auge ..... 7.
7. Die Stirn hat Augenbreite; Körper hochglänzend; die Decken haben schwarze Grundfarbe und gelbe Flecken. (Java; Sumatra.)
P. perpolitum sp. nov.
Stirn viel schmäler als ein Auge; Flügeldecken mit gelber oder roter Grundfarbe und schwarzer Zeichnung ..... 8.
8. Naht rot; die schwarzen Querbinden gehen nicht durch; Stirn der Länge nach vertieft. (Sumatra.) ..... **P. sumatranum** sp. nov.
Naht schwarz; die schwarzen Binden gehen über beide Decken; Stirn flach. Weit verbreitet (*Plagiatum* Waterhouse nec Motschulsky.)
P. waterhousei nom. nov.
9. Stirn des Männchens mit einem einzigen kegelförmigen, flachgedrückten Horn; die schwarzen Flügeldecken mit vier grossen, gelben Flecken ..... 10.
Stirn mit zwei Hörnern oder asymmetrisch; Flügeldecken mit Binden oder einem dunklen Längswisch, nie mit grossen, gelben Flecken .... 12.

[2] Siehe auch die zweite Tabelle für diese Gruppe, pp. 545–547.

10. Der vordere Fleck ist bindenartig, vorn und hinten gezackt; die mittleren Fühlerglieder sind 1.5 mal so breit wie lang; der Eindruck der Stirn beim Männchen geht nicht über den Hinterrand der Augen hinaus. (Burma.) ..... **P. aurimaculatum** Gravely.

Der Vordere Fleck ist gross, nicht gezackt; die mittleren Fühlerglieder sind fast doppelt so breit wie lang; der Eindruck der Stirn beim Männchen geht jederseits des Hornes tief in den Nacken ..... 11.

11. Schmal oval, von der Gestalt des *P. subfascia;* der vordere Fleck ist nach innen erweitert, der hintere verwaschen; Zwischenräume deutlich gewölbt. (Celebes.) ..... **P. ribbei** sp. nov.

Breit oval; der vordere Fleck ist aussen erweitert, der hintere scharf begrenzt; Zwischenräume ganz flach (*tetraspilotum* Chevrolat nec Hope). (Malacca; Sumatra.) ..... **P. monoceros** nom. nov.

12. Kopf mit Gabelhorn beim Männchen (das heisst, zwei nebeneinander liegenden, parallelen Hörnern, die am Grunde verwachsen und plattenförmig sind). Subgenus **Basides** Motschulsky ..... 13.

Kopf des Männchens asymmetrisch oder mit zwei weit auseinander stehenden Hörnern ..... 16.

13. Die schwarzen Flügeldecken mit nur eine Binde vorn; Epistom des Männchens vorn mit Spitzchen. (Aru.) ..... **P. furcaticorne** sp. nov.

Die rötlichen oder rotbraunen Flügeldecken ausser der vorderen Binde mit Spitzenfleck oder einfarbig rotbraun; Epistom ohne Spitzchen ..... 14.

14. Flügeldecken ungefleckt; die Hornplatte des Männchens an der Basis scharfwinklig (ex Motschulsky). (Indien.)
P. rufopiceum Motschulsky.

Flügeldecken mit Flecken und Binden; Hornplatte des Männchens einfach blattförmig ..... 15.

15. Flügeldecken mit scharfbegrenzten Binden; 5 Millimeter und grösser; die Hörner des Männchens an der blattförmigen Basis parallel. (Malacca; Sumatra.) ..... **P. bifasciatum** Motschulsky.

Die Flecken ganz verwaschen; 4 Millimeter gross; die Hörner am Grunde schärg erweitert (ex Motschulsky). (Indien.)
P. plagiatum Motschulsky nec Waterhouse.

16. Flügeldecken ohne Flecken und Binden, mit hellen Rand oder einem dunkeln Längswisch;[3] Kopf asymmetrisch beim Männchen, das linke Horn ist grösser als das rechte, dieses tuberkelähnlich ..... 17.

Flügeldecken mit Flecken oder Binden; das linke Horn ist grösser, oder beide sind gleich ..... 18.

17. Stirn in beiden Geschlechtern tief eingedrückt; das längere Horn des Männchens behaart; Zwischenräume flach; die Epipleuren vorn flach. (Malacca; Sumatra; Borneo.) ..... **P. sericeum** Gebien.

Stirn in beiden Geschlechtern flach; das längere Horn nackt; Zwischenräume gewölbt; Epipleuren vorn konkav. (Insel Damma.)
P. asymmetricum Champion.

18. Kopf asymmetrisch beim Männchen, das rechte Horn ist grösser als das linke ..... 19.

[3] Hierher würde *recticorne* Lewis gehören, wenn es nicht besser bei den Arten mit metallischer Oberseite stände.

Kopf beim Männchen mit symmetrischen Hörnern; schmal oval; die vordere Binde ist einfach, gerade, nicht gezackt; Schulter schwarz (ex Motschulsky). (Indien.) ..... **P. ruficolle** Motschulsky.

19. Die vordere Binde ist sehr schmal, stark gezackt, und läuft innen schmal neben der Naht bis zur Basis; Kopf beim Weibchen tuberkuliert, beim Männchen mit zwei ungleichen, spitzen, nackten Hörnern; Epistom ohne Spitzchen; Fühler vom fünften Gliede an erweitert. (Indien.) ..... **P. pictipenne** sp. nov.

Die vordere Binde ist breit, kaum gezackt, innen nicht verlängert; Kopf beim Weibchen flach, beim Männchen mit ungleichen, nackten, spitzen Hörnern; Epistom des Männchens mit Spitzchen; Fühler vom vierten Gliede an erweitert ..... 20.

20. Flügeldecken der ganzen Länge nach tief gefurcht; Flecken verwaschen, der vordere nicht deutlich bindenförmig; die Grube des Kopfes beim Männchen hinten scharfkantig begrenzt. (Saleyer.) **P. sulcipenne** sp. nov.

Flügeldecken nur hinten gefurcht; wenigstens der vordere Fleck ist bindenartig; Grube des Kopfes hinten nicht scharfkantig begrenzt ..... 21.

21. Die ganze Spitze ist hellgefärbt, Vorderkörper braun; vordere Binde vorn ausgerandet. Weit verbreitet ..... **P. subfascia** (Walker).

Der hintere Fleck ist eine Querbinde und lässt die Spitze frei; Vorderkörper schwarz; vordere Binde vorn nicht ausgerandet. (Celebes; Borneo.) ..... **P. seminitens** Chevrolat.

22. Oberseite metallisch, bläulich, oder purpur-metallisch, nie mattschwarz, manchmal dagegen glänzend schwarz oder braun ..... 23.

Flügeldecken, meist die ganze Oberseite, mattschwarz[4] ..... 34.

23. Stirn in beiden Geschlechtern einfach, ohne Hörner oder Tuberkeln .. 24.

Stirn in beiden Geschlechtern gehörnt oder mit Tuberkeln (bei *recticorne* tief eingedrückt beim Weibchen) ..... 29.

24. Unter 5 Millimeter gross; hoch gewölbt, schmal; Hals hinter den Augen sehr dick, kaum eingeschnürt; viertes Fühlerglied dünn; Prosternum ungekielt. (Java.) ..... **P. javanicum** sp. nov.

Ueber 5 Millimeter gross; flach gewölbt; Kopf hinter den Augen stark eingeschnürt; schon das vierte Fühlerglied erweitert; Prosternum meist gekielt ..... 25.

25. Die Zwischenräume der Flügeldecken vollkommen flach, die Punktlinien daher ganz oberflächlich ..... 26.

Zwischenräume deutlich gewölbt, die Streifen also mehr oder minder furchig ..... 27.

26. Oberseite gleichmässig blau, 7 bis 9 Millimeter gross; die ersten Abdominalsegmente sehr fein behaart. (Formosa.) .. **P. coeruleum** sp. nov.

Oberseite braun erzfarben, 5 bis 7 Millimeter gross; die ersten Segmente nackt. (Java.) ..... **P. chalceum** sp. nov.

27. Fünf Millimeter gross; Flügeldecken tief gestreift; Stirn kräftig eingedrückt; grünlich metallisch. (Japan.) ..... **P. sylvestre** Lewis.

Ueber 7 Millimeter gross; Flügeldecken schwächer gestreift; Stirn schwach eingedrückt; purpurn oder schwärzlich metallisch ..... 28.

[4] *Platydema sericeum* kommt vereinzelt in sehr dunklen Stücken vor, gehört aber wegen der asymmetrischen Kopfbildung nicht in diese Abteilung.

28. Purpurfarben, Naht grün; Fühler dick, Glieder kräftig quer; die ersten Abdominalsegmente fein behaart. (Formosa.)
P. sauteri Gebien.

Schwärzlich erzfarben, Naht gleichfarbig; Fühler dünn, Glieder so breit wie lang; die ersten Segmente nacht. (Japan.)
P. lynceum Lewis.

29. Oberseite ohne Metallglanz, schwärzlich oder braun ..... 30.
Oberseite metallisch ..... 31.

30. Oberseite braun oder rotbraun; Epistom des Männchens mit feinem Spitzchen; die Grube des Kopfes hinten scharfkantig, die Kante in der Mitte leicht vorgezogen; Propleuren stark gerunzelt und punktiert; Tarsen auffallend lang. (Japan.) ..... **P. recticorne** Lewis.

Oberseite Glänzend kohlschwarz; Fühler und Beine rotbraun; Epistom des Männchens ohne Spitzchen; Grube auf der Stirn nicht scharfkantig begrenzt; Propleuren schwach gerunzelt; Tarsen kurz; Schienen flach und dick. (Ceylon; Indien.) ..... **P. capreolum** Chevrolat.

31. Zwischenräume vollkommen flach; sehr breite, hoch gewölbte Art, hell bronzefarben; Männchen mit sehr langen, dünnen, geraden Hörnern; erstes Glied der Hintertarsen so lang wie der Rest. (Japan.)
P. higonicum Lewis.

Zwischenräume gewölbt; Decken gefurcht; ovale Arten; Männchen mit kurzen Hörnern oder nur zwei scharfen Tuberkeln; erstes Glied der Hintertarsen viel kürzer als der Rest ..... 32.

32. Spitze der schwarzmetallischen Flügeldecken braun; Kopf des Männchens asymmetrisch, das rechte Horn ist etwas länger; Epistom mit Spitzchen. (Formosa.) ..... **P. haemorrhoidale** Gebien.

Decken einfarbig; Kopf des Männchens symmetrisch, ohne Spitzchen am Vorderrande ..... 33.

33. Vier bis 5 Millimeter gross; breit oval; Kopf beim Männchen kräftig gehörnt. Weit verbreitet ..... **P. marseuli** Lewis.

Sechs bis 7 Millimeter gross; schmal oval; Kopf des Männchens selten gehörnt, meist nur scharf tuberkuliert. (Japan.)
P. nigroaeneum Motschulsky.

34. Kopf beim Männchen mit drei Hörnern oder scharfen Tuberkeln; Epipleuren rot. Weit verbreitet (*reflexum* Chevrolat.)
P. tricuspis Motschulsky.[5]

Kopf beim Männchen ohne Hörner; Epipleuren meist schwarz oder braun ..... 35.

35. Die Stirn höchstens 1.5 mal so breit wie ein Auge von oben gesehen; grosse Arten; Mittelschienen des Männchens stark S-förmig gekrümmt ..... 36.

Stirn doppelt so breit wie ein Auge; kleine Arten; die Schienen beim Männchen gerade ..... 38.

36. Die mittleren und vorletzten Fühlerglieder so breit wie lang; Prosternum vorn eingedrückt, nicht gleichmässig abfallend; Mittelbrust breit bogig ausgeschnitten, die Ecken nicht scharf blattartig; Vorderecken des Pronotums weit vorragend. (Japan.)
P. umbratum Marseul.

[5] In die Nähe muss auch das mir unbekannte *P. alticorne* Gravely mit asymmetrischer Kopfbildung gehören.

Die mittleren und vorletzten Fühlerglieder stark quer; Prosternum vorn gleichmässig schwach, gesenkt, etwas dachförmig; Mittelbrust scharf V-förmig ausgeschnitten, die Kanten des Ausschnitts innen hoch erhaben; die Vorderecken des Pronotums treten schwächer vor ..... 37.

37. Fühlerglieder vom vierten an erweitert; Körper flächer; Seitenrand von oben breit sichtbar; Punkte der Streifen kräftig, Halsschild ganz schwarz; Stirn vorn mit kräftig eingedrückter Querfurche (*laticorne* Fairmaire; *annamitum* Fairmaire; *malaccum* Marseul; *valgum* Pascoe). Weit verbreitet..... **P. detersum (Walker).**

Fühlerglieder vom fünften an erweitert; Kopf bis vorn gleichmässig flach, ohne Querfurche; Körper stärker gewölbt, glatt; Halsschild meist mit grossen, roten Scheibenfleck; Seitenrand des Körpers vorn auf den Decken von oben überwölbt; Punkte der Streifen sehr fein (*moerens* Perty). (Java.)..... **P. maculicolle** Castelnau und Brulle.

38. Männchen mit zwei rundlichen Tuberkeln auf der Stirn; nur die Tarsen sind rot; Punkte der Streifen weitläufig (zwei oder drei haben in dem Abstand zwischen zwei Punkten Platz). (Ceylon.)
P. velutinum Walker.

Männchen ohne Tuberkeln auf der Stirn; die ganzen Beine rotbraun; Punkte der Streifen eng (ein oder zwei Punkte haben in dem Abstand zwischen zwei Punkten Platz). (Formosa.).... **P. formosanum sp. nov.**

Zur Gewinnung natürlicher Artengruppen und zur scharfen Scheidung ist zwar die Berücksichtigung der ausgezeichneten Kopfbildung des Männchens unerlässlich, aber um auch Weibchen bestimmen zu können gebe ich hier eine zweite Tabelle, die besonders auf die Färbung Rücksicht nimmt; doch lassen sich einige Arten nur sicher im männlichen Geschlecht unterscheiden. Ausser den nachstehenden Arten liegen mir von dieser Gruppe noch mindestens zehn Arten in einzelnen Weibchen vor, die ohne Kenntnis des Männchens nicht beschrieben werden können.

Tabelle für die gezeichneten oder gefleckten oder halbgerandeten Arten.

1. Flügeldecken ohne Binden oder begrenzte, helle Flecken..... 2.
Flügeldecken mit begrenzten hellen Flecken, oder Binden (gelben oder schwarzen) ..... 4.

2. Männchen symmetrisch mit gebogenen, am Grunde winklig verbreiterten Hörnern. Glänzend rotbraun (ex Motschulsky). (Indien.)
P. rufopiceum Motschulsky.

Kopf des Männchens asymmetrisch, mit geraden, dicken Hörnern. (Sunda Inseln.)..... 3.

3. Stirn in beiden Geschlechtern tief eingedrückt; Zwischenräume flach; Epipleuren vorn flach; das längere Horn des Männchens behaart.
P. sericeum Gebien.

Stirn flach, Zwischenräume gewölbt; Epipleuren vorn konkav; das längere Horn des Männchens ist nackt. (Insel Damma.)
P. asymmetricum Champion.

4. Wangen so breit wie die Augen; Flügeldecken mit drei gezackten, schwarzen Querbinden. (Formosa; Hinterindien.)
P. flavopictum Gebien.
Wangen schmäler als die Augen; Flügeldecken anders gezeichnet.... 5.
5. Flügeldecken mit grossen, mehr oder weniger rundlichen Flecken, eine Binde auch vorn nicht ausgebildet, oder die Flecken sind ganz verwaschen ..... 6.
Flügeldecken wenigstens vorn mit ausgebildeter, schwarzer oder gelber Querbinde ..... 10.
6. Körper auffallend flach und parallelseitig; Männchen ungehörnt..... 7.
Körper gewölbt, oval; Männchen manchmal gehörnt..... 8.
7. Unterseite rotbraun; Halsschild auf mehr als die Endhälfte parallel; 6 Millimeter gross. (Mentawei.)..... **P. pilosiventre** sp. nov.
Unterseite schwarz; Halsschild auf ein Drittel der Länge parallel; 5 Millimeter gross. (Borneo.)..... **P. planum** Gebien.
8. Die Spitze der Decken ist ganz rotgelb, sie sind hochglänzend schwarz und haben einen kleinen, meist queren gelben Fleck vorn; Kopf beim Männchen ungehörnt. (Java; Sumatra.)
P. perpolitum sp. nov.
Ein Fleck vor der Spitze ist hell; Männchen gehörnt..... 9.
9. Flecken verwaschen; Männchen mit Gabelhorn (die Art hat vielleicht Binden und gehört in die Nähe von *bifasciatum*). (Indien.)
P. plagiatum Motschulsky.
Je zwei grosse, scharf begrenzte Flecke auf den Decken; Männchen mit einzelnem, geraden, konischen Horn (*quadrispilotum* Chevrolat).
P. monoceros nom. nov.
10. Die Spitze der Decken selbst ist breit gelbrot, es ist hinten also kein Fleck auf dunklem Grunde vorhanden..... 11.
Die Spitze ist dunkel und hat eine quere, helle Binde oder einen grossen, gelben Fleck..... 17.
11. Prosternum hinten niedergedrückt; Vorderkörper durch dichte Punktierung matt; Flügeldecken gelb mit schmalen, schwarzen Binden; kleinste Art (*sodale* Waterhouse)..... **P. pallidicolle** Lewis.
Prosternum hinten wagerecht; Vorderkörper glänzend; Flügeldecken meist dunkel, mit breiten, gelben Binden (hierher auch *ruficolle* Motschulsky) ..... 12.
12. Die schmale, stark gezackte, gelbrote Binde ist innen neben der Naht bis zur Basis verlängert; Kopf in beiden Geschlechtern tuberkuliert oder gehörnt. (Indien.)..... **P. pictipenne** sp. nov.
Die breite gelbe Binde ist innen nicht zur Basis verlängert; Kopf höchstens beim Männchen gehörnt..... 13.
13. Die Naht ist rot, die schwarze Binde in der Mitte geht nicht durch; Kopf beim Männchen ungehörnt. (Sumatra.)
P. sumatranum sp. nov.
Die Naht ist schwarz, die schwarze Binde geht über beide Decken; Kopf beim Männchen oft gehörnt..... 14.
14. Zwischenräume der Decken flach oder sehr schwach gewölbt; Kopf des Männchens ohne Auszeichnung..... 15.
Zwischenräume der Decken gewölbt; Kopf des Männchens asymmetrisch gehörnt..... 16.

15. Flügeldecken schwarz mit gelbem, meist querem Fleck und breiter, gelber Spitze; Stirn so breit wie die Augen.... **P. perpolitum sp. nov.**
Flügeldecken gelbrot mit zwei schwarzen Querbinden (an der Basis und in der Mitte); Stirn schmäler als ein Auge (*plagiatum* Waterhouse). **P. waterhousei nom. nov.**
16. Decken der ganzen Länge nach tief gefurcht; Flecken etwas verschwommen, der vordere quer, aber nicht deutlich bindenartig; die Grube auf dem Kopf des Männchens. (Saleyer.) **P. sulcipenne sp. nov.**
Decken nur hinten stark, vorn schwach gefurcht; der vordere Fleck ist bindenartig; Grube des Kopfes hinten nicht scharfkantig. **P. subfascia (Walker).**
17. Flügeldecken schwarz, mit einer einzigen Binde vorn; Kopf des Männchens mit Gabelhorn und Spitzchen auf dem Epistom. (Aru.) **P. furcaticorne sp. nov.**
Flügeldecken auch mit Spitzenfleck oder Binde; Kopf selten mit Gabelhorn, dann nie mit Spitzchen ..... 18.
18. Kopf des Männchens mit Gabelhorn ..... 19.
Kopf mit einzelnem, konischen Horn oder asymmetrisch ..... 20.
19. Flügeldecken mit gut begrenzten Binden; 5 Millimeter und grösser; die Hörner des Männchens an der blattförmigen Basis parallel. (Malacca; Sumatra.) ..... **P. bifasciatum Motschulsky.**
Die Binden verwaschen; 4 Millimeter gross; die Hörner des Männchens am Grunde schräg erweitert (ex Motschulsky). (Indien.) **P. plagiatum Motschulsky.**
20. Flügeldecken vor der Spitze mit Binde; Kopf des Männchens asymmetrisch. (Celebes; Borneo.) ..... **P. seminitens Chevrolat.**
Flügeldecken vor der Spitze mit grossem, rundlichen, oder schwach eckigen Fleck; Kopf des Männchens symmetrisch, mit einzelnem, konischen Horn ..... 21.
21. Zwischenräume flach; der vordere, bindenartige Fleck ist gezackt; die mittleren Fühlerglieder sind 1.5 mal so breit wie lang. (Burma.) **P. aurimaculatum Gravely.**
Zwischenräume gewölbt; der vordere Fleck ist gross, nicht gezackt; die mittleren Fühlerglieder sind fast doppelt so breit wie lang. (Celebes.) ..... **P. ribbei sp. nov.**

ERSTE GRUPPE

Körper subzylindrisch, parallel, Oberseite glänzend braun, Männchen mit symmetrischer Kopfbildung.

Platydema ferrugineum (Motschulsky).

Hoplocephala ferruginea Motschulsky, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 467 (nec Lec. 1866).
Hoplocephala orientalis Gebien, Col. Cat. (1910–1911) 369 (nom. nov.).

Fast zylindrisch, einfarbig glänzend braun, Beine und Fühler gelbbraun.

Kopf des Männchens tief ausgehöhlt, die Höhle hinten stumpfkantig begrenzt. Die Punktierung ist ausserordentlich fein und nicht eng, der Vorderkopf ist halbkreisförmig und in der Mitte mit winziger Tuberkel versehen. Auf der Stirn, am Auge, befinden sich zwei sehr dicke, wagerechte, gleichgrosse, etwas konische, nicht spitze Hörner. Beim Weibchen ist die Stirn leicht eingedrückt und kräftiger als beim Männchen punktiert, und das Epistom ist gerade abgeschnitten. Die Augen sind bis zur Mitte von den Wangen durchsetzt, diese sind schmäler als die Augen. Der Hinterkopf ist kaum merklich zu einem Hals verengt. Die Fühler sind ziemlich schlank, von Glied 4 an erweitert, dieses ist so breit wie lang, das vorletzte fast doppelt so breit wie lang, das letzte nicht länger als breit. Das Kinn ist kräftig gewölbt.

Der Halsschild fällt an den Seiten senkrecht ab, die Seitenrandkante ist nur in der hinteren Hälfte von oben sichtbar, alle Ecken, besonders die hinteren, sind breit verrundet; der Vorderrand ist, von oben gesehen, gerade abgeschnitten, in der Mitte ungerandet, auch die Basis ganz ohne Randlinie, die basalen Grübchen sind länglich, sehr fein, die Punktierung ist sehr zart und wenig eng, in der Mitte erloschen.

Die Flügeldecken sind leicht gefurcht, nur der Nahtstreif ist hinten stark vertieft, die Zwischenräume sind deutlich gewölbt, mikroskopish fein punktiert, hinten verbindet sich Streifen 3 mit 8 und schliesst die verkürzten 4 bis 7 ein. Die Seitenrandkante ist von oben nirgend sichtbar.

Das Prosternum ist vorn leicht kompress, hinten sehr steil, fast senkrecht abfallend, mit etwas ausgeprägter Ecke versehen. Das Mesosternum ist scharf V-förmig ausgeschnitten und hat am Ausschnitt erhabene Kanten. Das Abdomen ist an den Seiten viel gröber als die Oberseite punktiert. Die Schenkel, besonders die hinteren, sind dick, die Schienen gerade, körnig rauh hinten mit einzelner, mässig scharfer Kante versehen. An den Hintertarsen ist Glied 1 etwas länger als 2 + 3.

Länge, 4.4 bis 5.6 Millimeter.

Ein Pärchen von Burma (*Helfer*), im Museum Stettin.

Motschulsky's Beschreibung von *Hoplocephala ferruginea* passt Wort für Wort auf unsere Art, so dass ich nicht zweifle sie richtig gedeutet zu haben, nur die Grössenangabe stimmt nicht ganz. Der Autor gibt 2 Linien an. Das kleinere der beiden Tiere hat ungefähr diese Grösse. Aber, obgleich die Art täuschend einer *Hoplocephala* gleicht—eben wegen der zylindrischen Gestalt—können wir sie nicht in diese Gattung stellen. Nicht

nur ist die Basis des Halsschildes ungerandet, auch das Posternum ist spitz und wagerecht, das Mesosternum V-förmig ausgeschnitten, das Endglied der Palpen nicht zylindrisch, das erste Glied der Hintertarsen ist nicht verkürzt, sondern länger als 2 und 3 zusammen—alle Charaktere die nur der Gattung *Platydema* zukommen. Noch ein Merkmal von generischem Wert kommt hinzu das bisher von den Autoren übersehen wurde: die Mittel- und Hinterschienen sind bei *Platydema* mit feiner krenulierter Kante oder einem Kiel versehen, bei *Hoplocephala* aber verrundet. Von allen asiatischen *Platydema* ist unsere Art sofort durch den zylindrischen Körper zu unterscheiden. Auch die Bewaffnung des Kopfes beim Männchen ist ein gutes Merkmal.

ZWEITE GRUPPE

Flügeldecken gezeichnet oder doch nicht einfarbig, nie mattschwarz und nicht metallisch. Kopf des Männchens oft asymmetrisch gehörnt.

Platydema flavopictum Gebien.

Platydema flavopictum GEBIEN, Arch. Natg. Abt. A, Heft 9, 79, 1913 (1914) 17, t. 1, f. 2.

Ich würde nicht gezögert haben auf diese Art eine neue Gattung zu gründen, wenn sie nicht allein stände. Mit gleichem Recht könnte man noch eine Anzahl anderer ebenso gut geschiedener Arten abtrennen. Das was unsere Art vor allen Indomalayern auszeichnet ist die Kopfbildung. Die Wangen haben Augenbreite und an den Fühlern sind nur sechs Glieder erweitert. Mir liegt jetzt weiteres Material vor.

Formosa, Chip-Chip, Februar, 1909; Fuhosho, März, 1909; Polisha, Oktober, 1909; Taihorin, November, 1910; Kosempo (*Hans Sauter* leg.). Burma, Carin Ghecù, 1,200 bis 1,400 Meter, Februar-März, 1888; Carin Asciuli Chebà, 1,200 bis 1,300 Meter, Januar, 1888 (*L. Fea*).

In den Sammlungen Berlin, Dahlem, Dresden, und Gebien.

Platydema planum Gebien.

Platydema planum GEBIEN, Saraw. Mus. Journ. 2 (1914) 17.

Von dieser Art habe ich an anderen Ort eine ausführliche Beschreibung geliefert. Sie weicht von dem eigentlichen Typus der Gattung durch den flachen, ziemlich parallelen Körper ab, der an *Diaclina* erinnert. Der Kopf ist auffallend breit und kurz. Bei der Art tritt ein eigentümlicher Sexualdimorphismus auf; das Männchen hat auf dem zweiten Abdominalseg-

ment einen Fleck wenig auffälliger, anliegender, gelber Härchen. Sehr ähnlich gezeichnet ist *P. quadrispilotum*, mit dem das Weibchen unserer Art sehr ähnlich ist, es ist aber oval, Fühler und Beine sind rot, der Kopf ist länger.

Banguey bei Borneo. Singapore.

Platydema pilosiventre sp. nov.

Breit und flach, in der Mitte auf längere Strecke parallelseitig, schwarzbraun, Beine etwas heller, jede Decke mit zwei grossen, gelben Flecken.

Der Kopf ist sehr breit und kurz, beim Männchen ungehörnt, doch finden sich am Innenrand der Augen zwei stumpfe Schwielen, wodurch die Mitte der Stirn etwas grubig vertieft erscheint. Die Augen sind sehr schmal und stark quer, aber doch nicht breiter als die Stirn vorn zwischen ihnen. Das Epistom ist vor den Augen so lang wie die Stirn vorn breit, die Clypealnaht ist gut ausgeprägt und liegt dem Vorderrand der Augen nicht hart an. Die Wangen sind in sehr starkem Bogen ganz verrundet. Die Punktierung ist ungleich, auf dem Epistom und ganz hinten sehr fein, in der flachen Grube der Stirn viel gröber und dichter, lässt aber blanke Stellen frei. Die Fühler sind lang und bis auf die ersten Glieder schwarz; Glied 3 ist fast zylindrisch, 4 ebenso lang, aber sehr viel breiter, so breit wie lang, 5 und die folgenden sind quer, 1.5 mal so breit wie lang, das letzte ist etwas länger als breit. Das Kinn ist bis auf einen schmalen, scharf erhabenen Rand an der Basis und an den Seiten vertieft und im Grunde flach, in der Mitte mit einem kurzen, senkrechten Haarpinsel versehen.

Der Halsschild ist wie bei *planum* gebildet, nicht wie bei fast allen anderen Arten, also nicht von der Basis an verengt, sondern in der Endhälfte parallelseitig. Dadurch gewinnt das Tier eine ganz andere Gestalt, da der Körper nicht oval ist, sondern elliptisch, ungefähr wie die *Hoplocephala*-Arten, nur sehr flach. Die quere Wölbung ist stark, besonders vorn, die basalen Grübchen sind stark entwickelt, die Vorderecken sind breit verrundet, die hinteren durch die dort vorgezogene Basis ganz stumpf. Die Punktierung ist sehr fein und mässig eng.

Die flachen Flügeldecken sind schwarz und haben zwei grosse, gelbe Flecke: der vordere ist über doppelt so breit wie der schwarze Raum vor ihm, er ist von der Schulter her schwach schräg und lässt den Seitenrand und den Nahstreif frei, hier ist er kreisförmig gerundet, weder vorn noch hinten gezackt. Der schwarze, mittlere Raum ist ungefähr so breit wie der

Fleck. An der Spitze findet sich der zweite halbkreisförmige Fleck, der im Nahtstreif geradlinig verläuft. Auch dieser Fleck ist gross, der Seitenrand in der ungefähren Breite von zwei Zwischenräumen mit der Spitze zusammen schwarz. Die Punktlinien sind sehr deutlich, ihre Punkte stehen eng, aber nicht gedrängt, nur der Nahtstreif ist hinten vertieft. Alle Zwischenräume, auch die seitlichen, sind ganz flach, sie sind mikroskopisch fein, oberflächlich und sehr weitläufig punktiert.

Die Unterseite ist rotbraun, das Prosternum ganz wagerecht, nur ganz vorn gesenkt, es ist sehr spitz, ungefurcht, die Propleuren sind vorn gewölbt, also nicht verflacht oder gar ausgehöhlt. Die Mittelbrust ist scharf V-förmig ausgeschnitten, die Ecken sind scharf und erhaben lappenförmig ausgebildet. Der Abdominalfortsatz ist spitz: beim Männchen sind das erste und zweite Abdominalsegment in der Mitte ziemlich lang, abstehend goldgelb behaart, die Segmente sind fein punktiert und etwas gerunzelt. Die Beine sind ziemlich kurz, die Schienen gerade, die Tarsen kurz, an den hinteren ist Glied 1 wenig länger als 2+3. Die Schienen haben einen schmalen und ziemlich fein krenulierten Kiel.

Länge, 6 Millimeter; Breite, 3.

Zwei Männchen von Mentawei, Si-Oban, April bis August, 1894 (*E. Modigliani*), im Museum Dahlem, von denen mir eines für meine Sammlung überlassen wurde.

Diese ungehörnte, gefleckte Art hat nur einen Verwandten, nämlich *planum*, sie ist aber wesentlich breiter, hat etwas breitere Stirn, einen auf längere Strecke parallelen Halsschild, rote statt schwarze Unterseite. Beide Arten bilden eine Gruppe ausgezeichnet durch die beim Männchen ungehörnte Stirn, in diesem Geschlechte behaarte erste Abdominalsegmente, den flachen, parallelen Körper, die vorn gewölbten Epipleuren.

Platydema pallidicolle Lewis. Tafel 1, Fig. 1.

Platydema pallidicolle Lewis, Ann. & Mag. Nat. Hist. VI 13 (1894) 398.

Platydema sodale Waterhouse, Ann. & Mag. Nat. Hist. VI 14 (1894) 70.

Klein, rotgelb oder gelb, die Augen und die Zeichnung der Decken schwarz, Beine und Fühler gelb.

Der Kopf ist in beiden Geschlechtern gleich, ungehörnt; die Stirn ist so breit oder breiter als ein Auge, flachgedrückt, kräftig und sehr dicht punktiert, am Innenrande der Augen finden sich zwei schwache unauffällige Tuberkeln, die von den Autoren

übersehen sind. Die verrundeten Ecken des Epistoms liegen so weit nach innen wie die Innenecken der Augen. Die Fühler sind kurz und dick, das vierte Glied ist kaum verbreitert, 5 ist dreieckig, kaum breiter als lang, die vorletzten sind fast doppelt so breit wie lang.

Der Halsschild hat eine schwach doppelbuchtige Basis, die Hinterecken sind schwach vorgezogen, sehr stumpf, die Vorderecken sind stark niedergedrückt, ganz verrundet, die Spitze erscheint also gerade abgestutzt. Die Punktierung ist dicht und kräftig, daher erscheint der Halsschild matt, die Mittellinie bleibt schmal frei.

Die Flügeldecken haben eine schmale, dunkle Basalbinde und eine zweite in der Mitte, beide werden durch die schwarze Naht verbunden, hier geht die schwarze Färbung meist über die letzte Binde etwas hinaus; die Basalbinde lässt gewöhnlich die Schulterbeule frei. Die Zeichnung ist übrigens etwas variabel. Die Punktstreifen sind recht deutlich, die Punkte in ihnen vorn gröber. Die Zwischenräume sind schwach gewölbt, nur an den Seiten deutlicher, sie sind äusserst dicht und sehr fein punktiert, dadurch sind die Decken etwas matt und erscheinen schwach lederrunzlig.

Die Unterseite ist nackt oder fast nackt, das Prosternum ist hinter den Hüften deutlich niedergebogen und dann mit dem Fortsatz versehen. Das Abdomen ist kräftig punktiert und gerunzelt. Die Beine sind dünn, an den Hintertarsen ist Glied 1 etwas länger als 2 + 3.

Länge, 2.7 bis 3 Millimeter.

Zwanzig Exemplare in den Sammlungen Dahlem, Dresden, Leyden, London, München, und Gebien.

Bengalen. Hinterindien, Malacca. Cochin China. Formosa, Hoozan, 7 September, 1900 (*Sauter*). Japan, Yokohama (G. *Lewis*). Java, Bogares Tegal, Juli, 1889 (*Lucassen*); Mentawei, Si-Oban, April bis August, 1894 (*Modigliani*). Insel Dammer. Philippinen, Palawan, Puerto Princesa (*Baker*). Mindanao, Kolambugan (*Baker 14117*). Surigao. Luzon, Los Baños (*Baker*).

Ich habe keinen Zweifel dass *pallidicolle* und *sodale*[6] zusammengehören. Von der ersteren habe ich eine Cotype, und *sodale*

[6] Die Beschreibung beider Arten erschien 1894, aber *sodale* ist in Band 14, *pallidicolle* in Band 13 der Ann. & Mag. Nat. Hist. erschienen. Letztere hat daher die Prioritat. Uebrigens bestätigt auch das mir von Herrn Blair nachträglich zugegangene Material meine Anschauung, der ein Tier von den Philippinen mit der Bezeichung "*Pl. pallidicolle=sodale*" versieht.

habe ich nach Waterhouse's guter Beschreibung identifiziert; sie passt genau auf die Type von *pallidicolle* und die andern Stücke der sehr weit verbreiteten Art.

Unsere Art hat grosse Aehnlichkeit mit dem ebenso weit verbreiteten *P. plagiatum* Waterhouse, ist aber wesentlich kleiner, anders gezeichnet, die Stirn ist sehr viel breiter, die Oberseite ist durch dichte Punktierung rauh. Ein besonders wichtiges Merkmal ist das hinten nicht wagerechte Prosternum.

Platydema waterhousei nom. nov. Tafel 1, Fig. 2.

Platydema plagiatum WATERHOUSE, Ann. & Mag. Nat. Hist. VI 14 (1894) 70, nec Motschulsky, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 473.

Oval, kräftig gewölbt, glänzend, nackt, Kopf vorn, Fühler, Beine, Unterseite, und Halsschild rot, Flügeldecken rotgelb mit schwarzer Zeichnung, Hinterkopf und Augen schwarz.

Kopf beim Männchen ungehörnt, in beiden Geschlechtern gleich, die Stirn ist vorn sehr schmal, viel schmäler als ein Auge von oben gesehen, so breit wie das Epistom vor ihr lang, sie ist stark punktiert, in der Mitte, die sehr breit und schwach vertieft ist, mit einzelnen groben Punkten versehen. Die Quernaht ist tief eingedrückt, die undeutlichen Ecken des Epistoms, das nicht durch ein Spitzchen ausgezeichnet ist, liegen viel weiter nach aussen als die Innenecken der Augen. Die Fühler sind kurz und dick, Glied 3 ist zylindrisch, viel länger als dick, 4 verbreitert, ganz verrundet dreieckig, so breit wie lang, alle folgenden sind stark quer, 11 oval. Die Augen treten auf der Unterseite des Kopfes bis zu dem Maxillarausschnitt und sind durch einen sehr schmalen Zwischenraum von ihm getrennt.

Der Halsschild ist an der Basis weit über doppelt so breit wie in der Mittellinie lang, die Basis ist stark doppelbuchtig und an den Hinterecken nach vorn gezogen, diese sind daher sehr stumpfwinklig. Die Spitze ist äusserst fein gerandet, gerade abgestutzt. Die Punktierung ist deutlich und wenig eng, die Mittellinie bleibt nicht deutlich frei, die basalen Grübchen sind kräftig und meist an der Basis durch einen sehr feinen aufgebogenen Rand verbunden.

Die Flügeldecken sind gelb; die Naht fast bis zur Spitze, die ganze Basis bis auf die äusserste Kante und eine schmale mittlere Querbinde, die den Seitenrand frei lässt, sind schwarzbraun. Oder mit andern Worten, die Flügeldecken sind schwarz; eine sehr breite, nach innen noch etwas erweiterte Querbinde und ein ausserordentlich grosser Spitzenfleck, der sich dem vorderen

stark nähert, sind gelb. Die Punktlinien sind kräftig, die Zwischenräume auf der Scheibe flach, an den Seiten deutlich gewölbt. Meist sind der dritte und fünfte auf dem gelben Fleck vorn etwas breiter als die andern, alle Streifen laufen vorn tot aus.

Die Unterseite ist rot, nackt, kräftig punktiert; das Prosternum ist vorn nicht gekielt, das Abdomen ist an den Seiten kräftig längsgerunzelt. An den Hintertarsen ist Glied 1 kaum länger als 2 + 3.

Länge, 3.8 bis 4.2 Millimeter.

Circa 40 Exemplare in den Sammlungen Dahlem, Dresden, Leyden, München, Gebien, und London.

Malacca. Sumatra, Fort de Kock (*G. Severin*). Mentawei, Si-Oban, April bis August, 1894 (*Modigliani*). Java, Semarang, Juni, 1906 (*Drescher*); Bogares Tegal, Juli, 1889 (*Lucassen*). Banguey bei Borneo. Philippinen, Mount Maquiling (*Baker*). Palawan, Puerto Princesa (*Baker*). Mindanao, Kolambugan (*Baker 14109, 14102*); Surigao (*Baker 15264*). Insel Dammer.

Die Art lässt sich nach Waterhouse's guter Beschreibung mit ziemlicher Sicherheit identifizieren. Von dem gemeinen *P. subfascia* unterscheidet sie sich durch mehr ovalen, stärker gewölbten Körper, glänzende Oberseite, andere Zeichnung, und besonders durch den in beiden Geschlechtern ungehörnten Kopf.

Platydema waterhousei var. dohrni var. nov.

Von Liangagas und Soekaranda, Sumatra (*H. Dohrn*) liegt mir eine interessante Varietät vor, bei welcher die schwarze Färbung der Decken stark zunimmt; der hintere gelbe Fleck ist sehr kurz, schräg, da sich die Naht breit dreieckig in ihn hineinschiebt, die vordere Binde ist viel schmäler als der schwarze Raum vor ihr, und ist zuweilen auf einen rundlichen Fleck beschränkt. Der Halsschild ist in der Mitte dunkel, nicht einfarbig rot.

Dreizehn Exemplare in den Sammlungen Stettin und Gebien.

Platydema perpolitum sp. nov.

Diese Art ist der vorigen ausserordentlich nahe verwandt, so dass eine ausführliche Beschreibung überflüssig ist. Ich hebe nur die Unterschiede hervor:

Nicht unwesentlich grösser und breiter, hoch glänzend, die Stirn ist viel breiter, so breit wie ein Auge von oben gesehen, die mittleren Fühlerglieder sind doppelt so breit wie lang, das letzte hat fast kreisförmigen Umriss. Die basalen Grübchen

des Pronotums sind sehr schwach, die Flügeldecken haben schwarze Grundfarbe, die quere gelbe Binde ist nicht breiter als der schwarze Raum vor ihr und zuweilen auf einen rundlichen, queren Fleck beschränkt, die schwarze Binde hinter diesem Fleck ist ebenso breit, die gelbe Spitze nimmt kaum ein Drittel der Länge ein, die Zwischenräume sind auch an der Seite ganz flach.

Länge, 4 bis 5 Millimeter.

Java, Bogares Tegal, Juli, 1889 (*Lucassen*).

Neun Exemplare in den Sammlungen Leyden und Gebien.

Platydema sumatranum sp. nov.

Oval, kräftig gewölbt, rot, glänzend, der Hinterkopf dunkler, zwei quere Flecken auf jeder Decke schwarz.

Der Kopf ist ungehörnt, die Stirn ist vorn nur wenig breiter als die halbe Augenbreite von oben gesehen, das Epistom ist etwas länger als die Stirn vorn breit; die Mitte ist der Länge nach seicht eingedrückt, die Ecken des Epistoms liegen viel weiter nach aussen als die Innenwinkel der Augen. Die Punktierung ist vorn fein und dicht, zwischen den Augen wesentlich gröber. Die Fühler sind ganz rot, verhältnismässig lang, schon Glied 4 ist erweitert, aber nicht breiter als lang, die folgenden sind 1.5 mal so breit wie lang, das letzte ist gestreckt, fast doppelt so lang wie breit. Auf dem Unterkopf treten die Augen bis an den halbkreisförmigen Maxillarausschnitt.

Der Halsschild ist 2.5 mal so breit wie lang, die Basis ist an den Hinterecken kräftig vorgezogen, diese sind also sehr stumpf; der Vorderrand ist von oben gesehen gerade, die Ecken sind breit verrundet, die Spitze ist in der Mitte zwar undeutlicher, aber doch vollständig gerandet. Die Punktierung ist sehr deutlich, an den Seiten kaum gröber, ziemlich weitläufig.

Die Flügeldecken sind rot, nur die Basis hat eine quere, durchgehende, schwarze Binde, ein ebenso breiter, schwarzer, querer Fleck befindet sich vor der Mitte, er lässt die Naht rot. Die Punktstreifen sind ähnlich wie bei *waterhousei* mässig stark, die Zwischenräume sind auf der Scheibe ganz flach, an den Seiten deutlich gewölbt, auch an der Spitze, der Seitenrand bleibt von vorn bis hinten rot. Die Punktierung der Zwischenräume ist selbst bei starker Vergrösserung undeutlich. Unterseite und Beine zeigen keine besonderen Merkmale.

Länge, 4 bis 4.4 Millimeter.

Drei Exemplare im Museum Stettin, von denen mir eines für meine Sammlung überlassen wurde.

Sumatra, Soekaranda (*Dohrn*); Liangagas (*Dohrn*).

Diese Art ist mit dem häufigen *P. waterhousei* nahe verwandt, aber durch die ganz andere Zeichnung der Decken geschieden; bei unserer Art ist die Naht ganz rot, die hintere schwarze Binde geht nicht durch, sondern bildet auf jeder Decke nur einen queren Fleck; ausserdem ist die Stirn der Länge nach deutlich vertieft und die Zwischenräume sind nicht deutlich punktiert. *Platydema pallidicolle* ist zwar ähnlich wie unsere Art gezeichnet, hat aber viel breitere Stirn, stärkere Punktierung, wodurch es matt erscheint, und einen nicht wagerechten Prosternalfortzatz.

Platydema monoceros nom. nov. Tafel 1, Fig. 3 und 4.

Platydema tetraspilotum CHEVROLAT, Compt. Rend. Soc. Ent. Belg. 21 (1878) CXLIX, nec *tetraspilotum* Hope.

Die oben angeführte Namensänderung ist notwendig geworden da Chevrolat's Name sprachlich richtig *tetraspilotum* heissen müsste, da kollidiert er mit dem älteren Namen von Hope.

Der Autor glaubt dass diese Art das Männchen zu seinem *P. rubromarginatum* sei. Von dieser letzteren Art habe ich eine Type aus dem Museum München vor mir, und es zeigt sich dass sie nicht einmal zur Gattung *Platydema* gehört, sondern zu der von Chevrolat selbst aufgestellten Gattung *Ischnodactylus*. Uebrigens ist auch die Zeichnung beider Arten so verschieden dass es mir unverständlich ist wie der Autor zu seiner Meinung gekommen ist dass sie als die beiden verschiedenen Geschlechter zu einer Art gehörten. Es ist verzeihlich dass ich dem Autor ein entscheidendes Urteil über seine beiden Arten einräumte und im Coleopterorum Catalogus die beiden Arten als Synonym betrachtete. Da die Beschreibung bei Chevrolat nur bescheidenen Ansprüchen genügen kann, gebe ich hier eine neue:

Oval, ziemlich flach, glänzend schwarzbraun, Flügeldecken mit grossen gelben Flecken, Unterseite, Fühler, und Vorderkopf rötlich, Beine gelb.

Der Kopf hat grob fazettierte, stark quere Augen, die innen fast winklig schräg nach vorn gezogen sind, die Stirn ist dort viel breiter als ein Auge und auch viel breiter als das Epistom vor ihr, beim Weibchen stark gewölbt, fein punktiert, beim Männchen tief ausgehöhlt, spiegelblank, die Grube ist besonders hinten, etwas hinter dem Innenrand der Augen, tief und am Hinterrand fast gekantet. Im Nacken entspringt ein einzelnes, von oben nach unten flach gedrücktes, wagerechtes, glän-

zendes, nacktes, langes Horn, das nicht sehr spitz ist; es ist am Grunde parallel, dann konisch verengt. Die Clypealsutur ist nur beim Weibchen sehr deutlich, die Wangen sind nicht grubig vertieft, viel schmäler als die Augen, gebogen verengt. Die verrundeten Ecken des Epistoms liegen etwas weiter nach aussen als die Innenecken der Augen. Die Fühler sind dick, Glied 3 ist nicht länger als 4, von diesem an sind alle quer, die vorletzten fast doppelt so breit wie lang, nur das letzte ist länger als breit. Der Unterkopf ist wie gewöhnlich hinter den Mundteilen leicht quer vertieft, die Augen sind von dem Maxillarausschnitt durch einen schmalen Zwischenraum getrennt.

Der Halsschild ist von der Basis an verengt, diese ist doppelt S-förmig geschwungen, ihr Rand also bei den Hinterecken stark nach vorn gezogen, wodurch diese sehr stumpfwinklig werden, die Vorderecken sind breit verrundet, der Vorderrand von oben gesehen gerade abgestutzt, äusserst fein, aber vollständig gerandet, basale Grübchen sind kaum ausgeprägt, statt ihrer findet sich an der Basis neben dem Mittellappen ein langer, schräger, schwacher Eindruck hart an der Basis.

Die Flügeldecken sind zwar stark gewölbt, so dass der Seitenabsturz fast senkrecht ist, doch ist der Seitenrand gerade noch von oben sichtbar. Die Färbung ist glänzend schwarzbraun. Es sind auf jeder Decke zwei grosse, gelbe Flecke vorhanden, welche den Nahtstreif und den Rand frei lassen; der vordere ist etwas quer, hinten fast gerade, vorn von der Naht nach der Schulter verbreitert, der schwarze Raum an der Basis ist viel schmäler als die Binde. Der hintere Fleck lässt die Spitze frei. Es sind Linien feiner, aber sehr deutlicher Punkte vorhanden, die nicht durch einen vertieften Strich verbunden sind, dementsprechend sind die sehr fein punktierten Zwischenräume vollkommen flach, nur die seitlichen deutlich gewölbt, der Nahtstreif ist hinten leicht vertieft.

Das Prosternum ist wagerecht, schmal, vorn etwas gekielt, der Fortsatz sehr spitz, hinten scharf senkrecht abgeschnitten; das Mesosternum ist schmal V-förmig ausgeschnitten, der mittlere Teil scharf abgesetzt, neben dem Ausschnitt nicht deutlich gerandet. Das Metasternum hat hinten eine sehr tiefe, gerade Querfurche, das Abdomen ist fein punktiert und an den Seiten gerunzelt.

Länge, 3.5 bis 5 Millimeter.

Zwanzig Exemplare beider Geschlechter in den Sammlungen Dahlem, München, Veth, und Gebien.

Malacca. Mentawei, Si-Oban, April bis August, 1894 (*Modigliani*). Sumatra, Manna (*Knappert*); Tandjong Morawa, Serdang (*Hagen*).

Diese Art ist von allen *Platydema* durch die Kopfbildung des Männchens ausgezeichnet, das ein einzelnes, wagerechtes, flaches Horn hat. Gleiche Bildung haben nur die beiden folgenden Arten und *P. novae-guineense* Gebien.

Platydema ribbei sp. nov.

Der vorigen Art sehr ähnlich, aber viel schmäler, von dem Bau des *P. subfascia*, während *monoceros* viel breiter ist. Die Oberseite ist rotbraun, die Flecken sind gelb, der vordere ist viel schmäler, mehr bindenartig, er erweitert sich nicht aussen, sondern innen, und ist weiter nach aussen so breit wie der dunkle Raum vor ihm. Der hintere Fleck ist hinten ganz verwaschen und lässt die Naht nur undeutlich dunkel. Die Punkte der Streifen sind viel gröber, die Streifen sind deutlich vertieft, besonders der erste ist der ganzen Länge nach eingedrückt.

Länge, 4 Millimeter.

Süd Celebes, Bonthain (*C. Ribbe*); Bantimoeroeng (*Ribbe*).

Zwei Männchen und 1 Weibchen in den Museen Berlin und Dresden.

Platydema subfascia sieht unserer Art auf den ersten Blick sehr ähnlich, ist aber im männlichen Geschlecht leicht an der Kopfbildung zu erkennen, es hat zwei asymmetrische, behaarte Hörner, während unsere Art ein einzelnes, nacktes Horn im Nacken hat. Das Weibchen dagegen ist sehr ähnlich, doch ist bei ihm die Stirn nicht wie bei *ribbei* einfach gewölbt, sondern flach eingedrückt und dort ziemlich grob punktiert. Uebrigens ist bei *P. subfascia* die vordere Binde schräge von der Schulter nach hinten und innen gerichtet und die Spitze ist ganz gelb, auch sind die Decken deutlicher gefurcht.

Platydema aurimaculatum Gravely.

Platydema aurimaculatum GRAVELY, Col. Rec. Ind. Mus. VIII 8 (1915) 523, t. 43, f. 3.
Platydema feae GEBIEN in litt.

Auch diese Art ist dem *P. monoceros* ähnlich, etwas grösser, ebenfalls oval, also viel breiter als die vorige Art, schwarzbraun glänzend; die Kopfbildung des Männchens ist ähnlich, doch geht der tiefe Eindruck jederseits des Kopfhorns nicht so weit nach hinten, nicht über den Hinterrand des Auges hinaus; beim

Weibchen ist die Stirn hinten viel flacher. Die Punktierung der Halsschildseiten its wesentlich gröber als bei voriger Art. Ganz anders ist die Zeichnung der Decken: der vordere Fleck ist bindenförmig, vorn und hinten gezackt, und etwas schmäler als der Raum hinter ihm nach dem Spitzenfleck hin. Die Fühler sind schlanker, die mittleren und vorletzten Glieder kaum 1.5 mal so breit wie lang.

Länge, 4.5 bis 4.8 Millimeter.

Abor-Land, Kobo, 4,000 Fuss, 30 November, 1911, in *Polyporus*.

Ein Männchen und 2 Weibchen von Burma: Bhamò, Juli, 1886 (*Fea*), im Museum Dahlem, von dem ich ein Weibchen für meine Sammlung erhielt. In Anzahl auch im Museum Calcutta, dass mir drei Exemplare der Typen für meine Sammlung überliess.

Platydema bifasciatum (Motschulsky). Tafel 1, Fig. 5, 6, und 7.

Basides bifasciatus MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 472.

Oval, kräftig gewölbt, glänzend schwarzbraun oder braun, Flügeldecken mit hellen Binden. Unterseite, Beine, und die ersten Fühlerglieder braun, bei den hellen Tieren rotgelb.

Der Kopf ist stark quer, die Augen treten stark vor, die Stirn zwischen ihnen ist nur ungefähr ein Drittel so breit wie ein Auge von oben gesehen, vorn am schmalsten, doch ist die Innenecke der Augen verrundet. Die Wangen sind schmal und nicht aufgebogen, der Vorderrand von Auge zu Auge bildet ungefähr einen Drittelkreisbogen, dessen Mitte gerade abgestutzt ist. Hart am Auge findet sich ein schmaler, kräftiger Quereindruck. Die Punktierung ist beim Weibchen sehr dicht und fein. Beim Männchen erhebt sich hinten auf der Stirn ein eigenartiges Horn: es steht am Grunde senkrecht auf der Stirn, ist breit, blattartig, dann biegt es, ziemlich hoch über dem Kopf stark nach vorn und läuft der Kopffläche parallel. Dieser letzte Teil ist in zwei lange, flachgedrückte, schmale, parallele Hörner geteilt, die nackt sind. An den Fühlern ist Glied 3 so lang wie 4, dieses etwas länger als breit, alle folgenden sind quer, bis auf das ovale letzte. Das Kinn des Männchens hat einen äusserst feinen Haarpinsel.

Der Halsschild ist kräftig gewölbt, besonders nach den Seiten hin, die Seiten sind von der Basis nach vorn verengt, der äusserst fein gerandete Vorderrand ist fast gerade abgestutzt,

die Vorderecken sind breit verrundet, die hinteren stumpf, die Punktierung ist sehr fein und dicht, aber recht deutlich.

Die Flügeldecken sind oval, der Seitenrand ist sehr schmal verflacht abgesetzt, die Punkte der kräftigen Streifen sind fein und ausserordentlich dicht, die Zwischenräume sind leicht gewölbt, besonders die seitlichen. Die Zeichnung besteht aus zwei Binden, von denen die vordere nur den Nahtstreif frei lässt, sie ist etwas breiter als der dunkle Raum vor ihr, am Vorder- und Hinterrande leicht gezackt. Vor der Spitze befindet sich eine mondförmige Zeichnung, deren Ränder aber stark verwischt sind, sie schliesst einen dunklen Raum seitlich von der Spitze ein. Die Unterseite ist nackt. An den Hintertarsen ist Glied 1 so lang wie 3 und 4 zusammen.

Länge, 5.5 bis 6.1 Millimeter; Breite, 2.7 bis 3.2.

Acht Männchen und 9 Weibchen in den Sammlungen München, Dresden, Dahlem, Leyden, und Gebien.

Malacca. Sumatra, Liangagas (*Dohrn*); Soekaranda (*Dohrn*). Tandjong Morawa, Serdang (*Hagen*).

Diese Art muss als Typus der Gattung *Basides* Motschulsky betrachtet werden, die vielleicht als Untergattung haltbar ist, wenn wir sie auf die nächstverwandten Arten beschränken. Der Autor bringt aber auch Arten hinein, die nicht anderes sind als echte *Platydema*. In seinem *B. picicollis* glaube ich das *P. subfascia* wiederzuerkennen, und *B. crassicornis* ist vielleicht kaum etwas anderes. Die Beschreibung von *B. ziczac* passt dagegen genau auf die Crypticine *Microcrypticus scriptipennis* Fairmaire.

Die vorliegende Art ist an der höchst eingenartigen Bewaffnung des Kopfes beim Männchen zu erkennen: sie trägt ein ungebrochenes Gabelhorn. Nach Motschulsky sind die folgenden Arten, die ich nicht kenne, nahe verwandt, doch gibt die Beschreibung der Hörner keinen sicheren Anhalt:

Platydema plagiatum (Motschulsky).

Basides plagiatus MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 472.

Statura praecedenti, sed minor, maculis rufis obscurioribus; breviter ellipticus; vix convexus, nitidus, piceus, ore, capite antice, palpis, antennis, elytrorum indeterminatis quatuor pedibusque plus minusve rufo-testaceis; capite in ♂ bicornuto, cornubus curvatis, basi oblique subdilatatis; thorace transverso, punctulato, elytris punctato striati, interstitiis levigatus. L. 1⅝, lat. 1 lin.

Plus petit que le précédent, avec les taches des élytres moins distinctes, souvent presque effacées. Ind. or.

Platydema rufopiceum (Motschulsky).

Basides rufopiceus Motschulsky, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 473.

Statura praecedentis sed paulo minor, immaculatus; breviter ellipticus, vix convexus, nitidus, rufopiceus, palpis, antennis, corpore subtus pedibusque dilutioribus; capite in ♂ bicornuto, cornibus curvatis, valde approximatis, basi lamelliforme angulatum dilatatis thorace vix punctulato; elytris punctato-striatis, interstitiis subtilissime punctulatis. L. $1\frac{2}{3}$, lat. $\frac{5}{6}$ lin.

Tout à fait comme le précédent, mais sans taches rousses determinées sur les élytres et avec les cornes sur le tête du ♂ anguleusement dilatées à la base. Ind. or.

Platydema furcaticorne sp. nov. Tafel 1, Fig. 8 und 9.

Breit oval, hoch gewölbt, glänzend kohlschwarz; Beine, Unterseite, und Kopf schwarzbraun, eine Querbinde vorn auf den Flügeldecken gelbrot.

Der Kopf ist auf der Stirn nicht eingedrückt beim Männchen mit Gabelhorn: die Stirn erhebt sich, von der Seite gesehen, stark kammförmig. Auf diesem Kamm findet sich jederseits ein langes, dünnes, rundes, nacktes Horn, die Aussenkante dieser Hörner geht direkt zur Stirn nieder, oder mit andern Worten: von hinten gesehen erhebt sich auf der Stirn eine quere, dünne Platte, welche in ein Doppelhorn ausläuft, dessen Aeste nach vorn leicht zusammenlaufen. Die Stirn ist vorn zwischen den Augen breiter als ein Auge von oben gesehen und breiter als das Epistom vor der breit eingedrückten Querlinie lang. Die Mitte der Stirn ist der Länge nach von den Hörnern an stumpf, aber schmal gekerbt. Das Epistom hat stumpf verrundete, deutliche Ecken, die weiter nach aussen liegen als die Innenecken der Augen, die Mitte des Vorderrandes hat ein aufgesetztes Spitzchen. Von der Seite gesehen bildet die Mittellinie des Kopfes von den Hornspitzen bis zur Mitte des Clypeus einen nahezu regelmässigen Halbkreis. Die kurzen Fühler überragen nur wenig die Mitte des Pronotums, die ersten Fühlerglieder sind rotbraun, das dritte ist konish, 1.5 mal so lang wie dick, das vierte so breit wie lang, die folgenden sind stärker quer, die vorletzten sind fast doppelt so breit wie lang. Auf der Unterseite des Kopfes sind die Augen durch einen ziemlich breiten Zwischenraum vom Maxillarausschnitt getrennt.

Der Halsschild ist fast dreimal so breit wie in der Mittellinie lang, die Basis ist schwach doppelbuchtig, bei den Hinterecken aber stark nach vorn gezogen, diese sind daher ganz stumpf. Die Querwölbung ist sehr stark, die basalen Eindrücke sind

schwach. In der Mitte an der Basis findet sich ein undeutlicher querer Eindruck. Die Spitze erscheint, von oben gesehen, schwach ausgerandet, sie ist vollständig, wenn auch sehr fein gerandet. Die Vorderecken sind breit verrundet.

Die Flügeldecken sind sehr stark gewölbt, die gelbe Binde ist schmal, so breit wie der schwarze Raum vor ihr, sie erreicht weder den Seitenrand noch die Naht, ihr Vorderrand ist gerade, der hintere leicht ausgebuchtet. Die Punktlinien sind gut ausgeprägt, ihre Punkte stehen nicht gedrängt, der erste ist von der Mitte an leicht vertieft, alle Zwischenräume sind ganz flach.

Die Unterseite ist nackt, das Prosternum ganz wagerecht, vorn nicht deutlich gekielt, es fällt hinten ganz senkrecht ab; die Mittelbrust ist tief and scharf V-förmig ausgeschnitten, die Seitenlappen des Ausschnitts sind dünn und hoch erhaben. Der Abdominalfortsatz ist schmal. An den Hintertarsen ist Glied 1 viel länger als 2 und 3 zusammen.

Länge, 5.5 Millimeter.

Ein Männchen von den Aru-Inseln, Waken (*O. Beccari*, 1873).

Das beim Männchen vorhandene eingentümliche Gabelhorn des Kopfes weist dieser Art einen Platz unmittelbar neben *P. bifasciatum* an, doch ist die Hornbildung etwas anders; von der Seite gesehen, bildet die Mittellinie des Kopfes einen Halbkreis, unter dem Horn ist ein Längskiel, das Epistom hat ein Spitzchen, das der andern Art fehlt, die Flügeldecken haben statt der zwei Binden nur eine.

Platydema sericeum Gebien.

Platydema sericeum GEBIEN, Saraw. Mus. Journ. 2 (1914) 16.

Von dieser Art findet sich an anderen Ort eine ausführliche Beschreibung. Sie gehört mit *subfascia, sulcipenne, seminitens,* und *asymmetricum* des indischen Gebietes, und *aries* aus Australien in eine Gruppe, ausgezeichnet durch asymmetrischen Kopf beim Männchen. Gleiche Erscheinung tritt auch bei einigen afrikanischen Arten der Gattung auf, wenn auch meist nicht so auffällig. Während aber bei *subfascia, sulcipenne, aries,* und *seminitens* das rechte Horn das grössere ist und das linke auf eine mehr oder minder stark erhabene Falte beschränkt, ist es bei *sericeum* und *asymmetricum* umgekehrt: es ist das linke, welches allein gut ausgebildet ist. Ferner ist unsere Art ausgezeichnet durch die in beiden Geschlechtern grubig vertiefte Stirn, den unpunktierten Halsschild, die matt seidige, statt einer glänzenden Oberseite, die bindenlosen Flügeldecken.

Malacca. Singapore. Sumatra, Tandjong Morawa, Serdang (*Hagen*). Mentawei, Si-Oban, April bis August, 1894 (*Modigliani*). Simalur, Lasiken, April, 1913 (*E. Jacobson*). Banguey bei Borneo. Philippinen, Mindanao, Kolambugan (*Baker*).

Im Berliner Museum befindet sich ein einzelnes Männchen einer neuen Art aus Celebes, die unserer Art sehr ähnlich ist, es ist aber leider zu schlecht erhalten als dass ich es zu beschreiben wage. Hier ist das linke, grössere Horn ohne Haarpinsel, die Grube des Kopfes ist hinten scharfkantig begrenzt. Das Tier von den Philippinen ist rein mattschwarz.

Platydema asymmetricum Champion.

Platydema asymmetricum CHAMPION, Entom. Mo. Mag. II 4 (1893) 274.

Diese Art von der Insel Damma ist mir unbekannt geblieben; doch ist die Beschreibung ausführlich und gut, so dass einer Einreihung der Art ins System nichts im Wege steht.

Es ist eigentümlich dass Champion seine Art für die einzige Tenebrionide mit asymmetrischer Kopfbildung hält. Sollte er wirklich die gemeinen Arten *P. subfascium* des indischen und *P. aries* des australischen Gebietes, die lange vor ihm beschrieben waren, nicht gekannt haben?

Die Bildung der sekundären männlichen Geschlechtsmerkmale am Kopf weisen unserer Art einen Platz neben *P. sericeum* an. Wie bei dieser Art ist das linke Horn das grössere, aber während bei *sericeum* die Stirn in beiden Geschlechtern grubig vertieft ist, ist sie hier breit flach gedrückt, auch ist das längere Horn nach der Beschreibung nackt, bei *sericeum* mit Haarpinsel versehen. Ferner sind die Decken gefurcht, die Epipleuren vorn konkav; auch die Färbung ist etwas anders.

Platydema subfascia (Walker). Tafel 1, Fig. 10 und 11.

Alphitophagus subfascia WALKER, Ann. & Mag. Nat. Hist. III 2 (1858) 284; GEBIEN, Saraw. Mus. Journ. II 5 (1914) 19.
Platydema celebum CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 178.
Platydema diversidens FAIRMAIRE, Ann. Soc. Ent. Fr. (1893) 24.
Platydema japanum MARSEUL, Ann. Soc. Ent. Fr. V 6 (1876) 76; LEWIS, Ann. & Mag. Nat. Hist. VI 13 (1894) 397.
Platydema ? picicolle MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 474.

Gestreckt, elliptisch, glänzend, Oberseite schwarz oder braun, die Spitze der Decken und eine vordere schräge Binde rot, Kopf, Unterseite, Fühler, und Beine rotbraun.

Der Kopf ist beim Männchen stark asymmetrisch, die Stirn ist stark grubig vertieft, die Grube ist hinten gerundet scharfkantig, blank, die Hörner stehen weit auseinander am Innenrand der Augen, das rechte allein ist gut ausgebildet (rechts und links bei Betrachtung von oben gerechnet), es ist kurz walzenförmig, innen am Ende behaart, das linke ist stark reduziert und bildet eigentlich nur eine sehr starke Augenfalte. Die Augen quellen stark vor, die Stirn ist nicht breiter als der Querdurchmesser eines Auges, die Wangen sind fast geradlinig stark verengt und viel schmäler als die Augen. Die ganz verrundeten Ecken des Epistoms liegen so weit nach innen wie die Innenecken der Augen. Am Vorderrand erhebt sich ein aufgesetztes, scharfes Spitzchen, am Epistom ist die Punktierung deutlich. Nicht selten ist auch das rechte Horn kurz, wird dann konisch, trägt aber selbst in den äussersten Fällen, wo es nur eine kegelförmige Tuberkel ist, an der Spitze ein Haarbüschelchen, dann ist die sonst glatte Grube der Stirn ebenfalls punktiert. Beim Männchen fehlen das Zähnchen des Epistoms und die Stirnhörner ganz, die Stirn ist ganz seicht vertieft und dort gröber punktiert als der Vorderkopf. Die Fühler erreichen die Basis des Pronotums. Glied 3 ist so lang wie 4, dieses verrundet dreieckig, so breit wie lang, von 5 an sind die Glieder stark quer oval mit geradem Oberrand. Auf der Unterseite des Kopfes treten die grossen Augen bis hart an den Rand des Maxillarausschnitts; hinter den Mundteilen ist ein leichter Quereindruck.

Der Halsschild hat einen gerade abgestutzten Vorderrand mit breit verrundeten Ecken, die basalen Eindrücke sind flach, die Basis ist an den Hinterecken vorgezogen, so dass diese sehr stumpf sind, die Spitzenrandung ist in der Mitte erloschen. Die Punktierung ist sehr fein, aber deutlich, nicht eng, vorn wesentlich feiner. Nicht selten ist der Halsschild vorn rot gefleckt.

Die Flügeldecken sind mässig stark gewölbt, der Rand ist von oben ganz sichtbar, es sind feine Punktstreifen vorhanden, die Zwischenräume sind mässig gewölbt, der erste Streifen ist hinten stärker vertieft, die Zwischenräume sind fein, aber deutlich punktiert. Die vordere Binde verläuft schräg von der Schulter nach der Naht, sie ist viel breiter als der Raum vor ihr und lässt den Seitenrand und den Nahtstreifen frei, sie ist vorn ausgeschnitten und hinten gezackt. Die Spitze ist breit gelbrot, doch ist der Fleck nicht scharf begrenzt und meist in der Gegend des sechsten und siebenten Zwischenraumes weit nach vorn gezogen.

Das Prosternum ist schmal, vorn stumpf rundlich gekantet, ohne Ecke am Vorderrand. Das Mesosternum ist scharf V-förmig ausgeschnitten, die Ecken sind aber, von der Seite gesehen, breit verrundet. An den Hintertarsen ist Glied 1 = 2 + 3.

Länge, 3 bis 3.8 Millimeter.

Ueber 100 Exemplare in allen Sammlungen.

Ceylon (*Nietner*). India Oriental, Bengal. Burma, Peger. Annam, Phuc Son, November-Dezember (*Fruhstorfer*); Hué (*Delauney*); Qui-Nhon (*Perraudière*). Malaccà. Cochin China. China, Canton; Lien-cao, 23 August, 1912 (*Mell*). Formosa, Hoozan, September, 1910. Japan, Hiogo, Nagasaki, Bukenji bei Yokohama (*Lewis*); Hagi (*Hiller*). Sumatra, Tebing-tinggi (*Schultheiss*); Fort de Kock (*van Riemsdyk*); Siboga, Oktober, 1890, bis März, 1891 (*Modigliani*); Liangagas (*Dohrn*); Soekaranda (*Dohrn*). Mentawei, Si-Oban, April bis August, 1894 (*Modigliani*). Java, Semarang, Juni, 1906 (*Drescher*), November, 1910 (*Jacobson*), Batavia, Juni, 1908 (*Jacobson*); Bogares Tegal, August, 1889 (*Lucassen*). Banguey bei Borneo.

Diese weit verbreitete Art ist an der Zeichnung und dem asymmetrischen Kopf des Männchens zu erkennen. Im Osten von Borneo wird sie durch *P. seminitens* und *sulcipenne* vertreten, über die weiter unten berichtet wird, in Australien durch *P. aries*, doch ist letztere Art grösser, die Zwischenräume sind kaum gewölbt und der hintere Fleck ist eine schmale Querbinde, entfernt von der Spitze.

Platydema seminitens Chevrolat.

Platydema seminitens CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 242.

Von dieser Art liegen mir die Typen aus dem Museum München vor, sie ist der vorigen Art täuschend ähnlich, so dass nur die Abweichungen zu erwähnen nötig sind: Etwas grösser, stark glänzend, tiefer schwarz, die Flügeldecken sind noch stärker gefurcht, schwächer punktiert, hinten findet sich kein grosser Spitzenfleck, sondern eine Querbinde vor der Spitze, sie ist schmal und geht meist bis ganz an die Seiten, den Seitenstreifen freilassend, die vordere Binde ist schmal, schräge, hinten nicht deutlich gezackt, vorn nicht ausgerandet.

Celebes (*Wallace*). Brunei auf Borneo. Sumatra (*Grelak*). Philippinen, Nueva Vizcaya, Imugan (*Baker*).

Ein Exemplar aus dem Museum München soll von Malacca stammen; ich bezweifle die Richtigkeit dieser Angabe.

Platydema sulcipenne sp. nov.

Lang oval, stark gewölbt, schwarzbraun, Unterseite, Fühler, die Ränder des Halsschildes, zuweilen auch jederseits ein undeutlicher Fleck vorn auf ihm und je zwei verwaschene Flecken auf den Flügeldecken rot, Beine gelblich.

Der Kopf ist beim Männchen tief muldig ausgehöhlt, die Grube hinten scharfkantig begrenzt, die Stirn ist vorn so breit wie der Querdurchmesser eines Auges und so breit wie das Epistom vor ihm lang, er ist in diesem Geschlecht asymmetrisch; das rechte Horn ist dick zylindrisch, wagerecht vorgestreckt, an der Spitze behaart, bei schwächer entwickelten Männchen ist es sehr kurz, mehr konisch, trägt aber auch am Ende ein Haarbüschel, die linke Seite hat nur eine etwas spitz erhabene Augenfalte, die Grube ist fast glatt. Das Epistom hat in der Mitte ein feines Spitzchen. Beim Weibchen ist die Stirn etwas flach gedrückt, dort gröber punktiert als vorn, auch ist hier die Quernaht tief eingedrückt, während beim Männchen wegen der grubig vertieften Stirn die Quernaht fehlt. Die Fühler sind kurz, vom vierten Gliede an erweitert, das vierte ist so breit wie lang, die folgenden sind stark quer, doppelt so breit wie lang, das letzte nicht breiter als lang. Am Unterkopf schieben sich die Augen bis an den Maxillarausschnitt, zwischen Maxillen und Augen befindet sich kein deutlicher Zwischenraum.

Der Halsschild ist von oben gesehen vorn gerade abgestutzt, dort äusserst fein, aber vollständig gerandet, die Vorderecken sind zwar verrundet, aber doch deutlich, die basalen Grübchen sind länglich, sehr deutlich, die Punktierung ist deutlich, fein, nicht eng, an den Seiten etwas gröber, die Hinterecken sind scharf, die Basis ist dort nicht stark nach vorn gezogen.

Die Flügeldecken haben je zwei Flecken, von denen der vordere direkt an der Schulter liegt, etwas schräg nach innen geht und die ersten Streifen frei lässt, der hintere Fleck ist in die Länge gezogen und nähert sich bei einem Exemplar dem vorderen fast bis zur Berührung, meist ist er nach der Spitze hin stark verbreitert. Beide Flecken sind schlecht begrenzt. Die Decken sind der ganzen Länge nach gefurcht, die Zwischenräume von der Basis an gewölbt, fein aber deutlich punktiert. Der Seitenrand ist von oben gerade noch sichtbar.

Die Unterseite ist nackt, rotbraun, das Prosternum schmal, vorn nicht gekielt, das Mesosternum scharf V-förmig ausgeschnitten, das Abdomen auf den vorderen Segmenten an den

Seiten grob punktiert. Die hinteren Schenkel sind viel dicker als die vorderen beiden Paare.

Länge, 3.6 bis 4 Millimeter; Breite, 2 bis 2.2.

Drei Männchen und 2 Weibchen von Saleyer (*Engelhard*) im Museum Leyden und in meiner Sammlung.

Diese Art ist nahe mit *subfascia* Walker verwandt und wurde von Fairmaire auch als solches bestimmt. Sie unterscheidet sich aber durch die verwaschenen Flecke, der vordere bildet keine eigentliche Binde und ist nicht gezackt, die Decken sind der ganzen Länge nach gefurcht, wenn auch vorn etwas schwächer, die Kopfbildung des Männchens ist wie bei *subfascia*, doch ist die Grube hinten scharfkantig begrenzt, die Vorderecken des Halsschildes sind weniger verrundet.

Platydema pictipenne sp. nov. Tafel 1, Fig. 12.

Oval, hoch gewölbt, Oberseite glänzend schwarz, Flügeldecken mit gelbroten Flecken und Binden, Unterseite braun, Fühler und Beine rotbraun oder fast gelblich.

Kopf gehörnt, die Hörner des Männchens ungleich, wagerecht, kurz, gerade und von der Seite gesehen etwas dreieckig, das rechte ist stets länger, nackt, spitz, das linke ist mehr eine scharfe Längsfalte, die Stirn zwischen den Augen ist eingedrückt, aber hinten nicht scharfkantig; sie ist 1.5 mal so breit wie eines der nicht stark queren Augen, die seitlich stark vorquellen, die Schläfen sind einfach, nicht eingezogen verengt, liegen also dem Auge nicht plattenförmig an. Die Wangen sind sehr viel schmäler als die Augen, der Vorderkopf verengt sich stark, fast geradlinig, er ist sehr lang, in der Längsrichtung stark gewölbt, die Ecken des Epistoms liegen so weit nach innen wie die Innenecken der Augen, die Quernaht ist stark eingedrückt. Die Punktierung ist ausserordentlich fein, nur auf dem Epistom deutlich, die Augen sind nicht schräg nach vorn gerichtet. Die Fühler sind dünn und lang, Glied 3 ist wesentlich länger als 4, dieses ist fast konisch, 5 so breit wie lang, die folgenden werden immer stärker quer, die vorletzten sind von der Seite gesehen fast halbkreisförmig, das letzte ist schwach länger als breit. Die Unterseite des Kopfes ist stark gewölbt, hinter den Mundteilen nicht quer eingedrückt, die Augen sind dort klein und vom Maxillarausschnitt durch einen breiten, flachen Zwischenraum getrennt.

Der Halsschild ist bis zum Rande stark gewölbt, die basalen Grübchen sehr fein, rundlich, die Vorderecken sind breit verrundet, die Spitze ist vollständig, aber sehr fein gerandet. Die Punktierung ist sehr fein, nicht gedrängt.

Die Zeichnung der Flügeldecken ist charakteristisch: sie ist von gelbroter Farbe; vor der Mitte befindet sich eine am Vorder- und Hinterrand stark gezackte Querbinde, die bis an den Rand reicht, sie ist innen, die Naht freilassend, bis zur Basis ausgezogen, auch der Vorderrand sendet meist in der Mitte einen längeren Ast nach vorn. Die Schulter und der Raum neben ihr an der Basis sind ebenfalls rotgelb. Auch die Spitze ist sehr breit gelbrot gefärbt, in diese Färbung geht die schwarze der Naht nicht tief hinein. Die Punktlinien sind nicht deutlich, fein eingeschnitten, ihre Punkte sind sehr fein und nicht übergreifend. Die Zwischenräume sind fast flach, sehr fein und nicht eng punktiert, an der Spitze erlöschen die Streifen. Eigentümlich ist der Verlauf des vierten: unmittelbar vor der gelben Binde nähert er sich dem dritten, dahinter dem fünften Streifen, er läuft also nicht gerade durch. Diese Bildung dürfte spezifischen Wert haben, da alle sieben Exemplare das Merkmal zeigen.

Die Unterseite ist braun, nackt, das Prosternum ist wagerecht, spitz, das Mesosternum ist scharf V-förmig ausgeschnitten, das Abdomen ist sehr fein punktiert, die beiden vorletzten Segmente sind an der Basis quer gefurcht. Die Schienen sind gerade, aussen nicht scharfkantig, an den dünnen Hintertarsen ist Glied 1 etwas länger als 2 + 3, viel kürzer als 3 + 4.

Länge, 4 bis 5 Millimeter.

Sieben Exemplare in meiner Sammlung.

Süd Indien, Madura, Shembaganur.

Diese Art scheint in beiden Geschlechtern durch die Kopfbildung ausgezeichnet zu sein. Sie ist an der Zeichnung, die keiner andern indischen Art zukommt, leicht zu erkennen. Ich vergleiche sie mit dem gemeinen *P. subfascia,* obgleich sie von ihm weit verschieden ist: sie unterscheidet sich durch ganz andere Zeichnung, breiten Körper, nackte Hörner, hinten nicht scharfkantig eingedrückte Stirn, nicht mit Spitze versehenes Epistom, hinten erloschene statt gefurchte Streifen, und durch die Bildung des vierten Streifens. Aeusserlich sehr ähnlich ist *P. flavopictum* von Formosa und Burma, hat aber andere Zeichnung (es sind in der Anlage drei schwarze Binden auf gelbem Grunde vorhanden), ungehörnten Kopf, die Wangen

haben Augenbreite, die beiden letzten Segmente sind nicht quer gefurcht.

DRITTE GRUPPE

Arten mit metallischer, oder schwarzer, blanker Oberseite, ohne Zeichnung, niemals mattschwarz.

Platydema javanicum sp. nov.

In der Gestalt an *Hoplocephala* erinnernd, ziemlich schmal, hoch gewölbt, oben blaugrün glänzend, Unterseite, Fühler, und Beine braungelb.

Der Kopf ist in beiden Geschlechtern ungehörnt, dick, die Stirn sehr breit, der Länge nach leicht eingedrückt, vorn zwischen den Augen fast doppelt so breit wie ein Auge von oben gesehen. Am Hinterkopf findet sich ein sehr leichter querer Eindruck, der Hals ist ungewöhnlich dick, die Schläfen sind daher hinter den Augen kaum eingeschnürt. Der Vorderkopf ist lang, die Quernaht gut eingedrückt, vom Vorderrand der Augen weit entfernt, das Epistom ist in der Mitte gerade abgestutzt. Zwischen den Augen zeigt sich auch bei starker Vergrösserung keine Schwiele. Die Punktierung ist fein, aber sehr deutlich. Die Fühler sind schlank, ganz gelb, Glied 3 ist doppelt so lang wie dick, auch 4 ist nicht erweitert, sondern ebenfalls konisch, länger als breit, die folgenden Glieder sind quer, die vorletzten fast doppelt so breit wie lang. Auf der Unterseite des Kopfes sind die Augen vom Maxillarausschnitt durch einen breiten Zwischenraum getrennt. Die Kehle ist dick geschwollen.

Der Halsschild ist querüber sehr stark gewölbt, die basalen Grübchen sind breit und gut entwickelt, die Basis ist hinter ihnen ganz leicht aufgebogen, der Vorderrand erscheint von oben gesehen leicht ausgeschnitten und die Vorderecken ragen schwach vor, sie sind kurz verrundet rechtwinklig, die Basis ist an den Seiten vorgezogen, dadurch sind die Hinterecken sehr stumpf. Die Punktierung ist fein, aber sehr deutlich, an den Seiten etwas gröber.

Die Flügeldecken sind querüber sehr stark gewölbt, die Seiten fallen senkrecht ab, so dass die Seitenrandkante von oben beinahe überdeckt ist. Es sind Reihen äusserst feiner, gedrängter Punkte vorhanden, die Zwischenräume sind ganz flach, nur der Nahtstreif ist eingedrückt, die Punktierung ist zwar sehr fein, aber deutlich.

Die Unterseite ist sehr fein, anliegend, kurz, sparsam behaart, das Prosternum ist vorn nicht gekielt, die Propleuren

sind vorn kaum ausgehöhlt. Die Beine sind dünn, an den Hintertarsen ist Glied 1 länger als die beiden folgenden zusammen.

Länge, 4.5 bis 4.6 Millimeter.

Vier Exemplare in den Sammlungen Dahlem, Veth, und Gebien.

Java Occidental, Pengalengan, 4,000 Fuss (*Fruhstorfer*); Tjinjiroean, Kina-Ondera, 1,700 Meter, Malabar Gebirge, April, 1910 (*H. W. van der Weele*).

Diese Art unterscheidet sich von dem ähnlichen *P. marseuli* durch ganz flache Zwischenräume, dicken Hals, einfachen Kopf, behaarte Unterseite, und andern Fühlerbau. Sie gehört in die Abteilung mit einfachem Kopf in beiden Geschlechtern und unterscheidet sich von den andern Arten durch geringe Grösse, sehr breite Stirn, schlankes vierte Fühlerglied, und sehr dicken Hals; von den meisten Arten dieser Gruppe durch ungekieltes Prosternum.

Platydema coeruleum sp. nov.

Lang oval, flach, von der Gestalt der *Ceropria induta*, die ganze Oberseite bläulich violett (die Seiten manchmal mehr grünlich), bei Ansicht gegen das Licht purpurn, Unterseite, Beine, und Fühler schwarzbraun.

Der Kopf ist in beiden Geschlechtern gleich ungehörnt, nicht tuberkuliert, sehr breit, flach, die Stirn ist der Länge nach kaum merklich eingedrückt, vorn nur wenig breiter als 2 und 3 der Fühler zusammen lang, so breit wie das Epistom vor ihr lang, vor den Augen befindet sich eine deutliche Grube, das Epistom ist in der Mitte gerade abgestutzt, ohne Tuberkel vorn; die Punktierung ist sehr deutlich, auf der Stirn etwas schwächer. Die Fühler sind dick, Glied 4 ist so breit wie lang, die folgenden sind 1.5 mal so breit wie lang. Das Mentum ist kräftig erhaben, fast tuberkuliert, die Augen treten bis an die Cardo der Maxilla, hinter dem Mentum ist der Unterkopf quer eingedrückt.

Der Halsschild ist über 2.5 mal so breit wie lang, von der Basis an kräftig nach vorn verengt, der Vorderrand ist, von oben gesehen, sehr schwach ausgeschnitten, doch sind die Ecken in der Randkante breit verrundet, die Basis ist jederseits an den Hinterecken deutlich vorgezogen, diese sind daher sehr stumpf. Die basalen Grübchen sind deutlich, die Punktierung ist sehr fein und wenig eng.

Die Flügeldecken sind flach, es sind feine, nicht eingedrückte oder vertiefte Punktlinien vorhanden, im vierten Streif stehen

ungefähr 50 Punkte, die Zwischenräume sind vollkommen flach, sehr deutlich, wenn auch fein punktiert.

Das Prosternum ist vorn gleichmässig und kräftig gesenkt, nicht gekielt, am Vorderrand rund, wenig tief gerandet. Es ist zwischen den Hüften flach, nicht gefurcht, hinten einfach dreieckig verengt, nicht sehr spitz. Die Propleuren sind vorn äusserst fein längsgestrichelt. Die Mittelbrust ist scharf V-förmig ausgeschnitten, aber nicht sehr schmal, oben neben dem Ausschnitt breit, das Abdomen zeigt auf dem ersten Segment feine, undeutliche, sparsame Behaarung. Die Beine sind ziemlich dick, die Schienen behaart, aussen dicht und gleichmässig krenuliert, an den Hintertarsen ist Glied 1 kaum länger als 4.

Länge, 7.1 bis 9 Millimeter; Breite, 4 bis 4.8.

Formosa, Kosempo, Januar und Februar, 1910; Hoozan, Februar, 1910; Taihorin, November, 1909 (*Sauter*).

In Anzahl in den Sammlungen Berlin und Gebien.

Diese Art ist inbezug auf Färbung kaum mit einer andern zu verwechseln. Sie gehört zu den grösseren der glänzenden, meist metallischen Arten. Ihr nächster Verwandter ist *P. sauteri*, gleichfalls von Formosa, aber nicht nur ganz anders gefärbt, sondern auch durch deutlicher eingedrückte Stirn, leicht gewölbte Zwischenräume, und höher gewölbten Körper verschieden. *Platydema lynceum* ist ebenfalls ähnlich, aber durch Färbung und Gestalt verschieden.

Platydema sauteri Gebien.

Platydema sauteri GEBIEN, Arch. Natg. Abt. A, Heft 9 79 1913 (1914) 15.

Der ausführlichen Beschreibung ist nur wenig hinzuzufügen: das Prosternum ist vorn schwach gesenkt, dort nicht gekielt, sondern rund, der Vorderrand ist mit sehr tiefer Randlinie versehen, auch das zweite Segment trägt Spuren von Behaarung. Die Beine sind verhältnismässig dick, die Schienen rund herum anliegend behaart.

Aus dem Berliner Museum liegen mir jetzt zwei weitere Exemplare vor von Formosa, Taihorin, Mai, 1910; Kosempo, Januar, 1910 (*Sauter*).

Platydema sylvestre Lewis.

Platydema sylvestre LEWIS, Ann. & Mag. Nat. Hist. VI 13 (1894) 394.

Die Art ist mir unbekannt geblieben. Nach der Beschreibung ist das Männchen ungehörnt. Von den vorhergehenden beiden

Arten ist sie durch geringe Grösse und die eingeschnittenen Punktlinien zu unterscheiden.

Japan.

Platydema lynceum Lewis.

Platydema lynceum Lewis, Ann. & Mag. Nat. Hist. VI 13 (1894) 395.

Von dieser Art liegt mir nur eine Cotype aus meiner Sammlung vor. Sie ist nahe mit *sauteri* verwandt, ebenfalls von der Gestalt einer *Ceropria*, von ihr aber sicher artlich verschieden, sie ist nicht nur kleiner und schmäler, sondern auch düster, fast schwärzlich gefärbt, ganz anders sind die Fühler gebaut, die Glieder sind nicht quer, sondern so breit wie lang, die Punktierung der Zwischenräume ist kaum wahrnehmbar, bei *sauteri* dagegen sehr deutlich, wenn auch sehr fein, auch ist der Nahtstreif nicht anders gefärbt. Der Halsschild ist an den Seiten flach abgeschrägt, bei *sauteri* dagegen deutlich gewölbt.

Japan, Nautaizan, Yokohama, Junsai.

Platydema chalceum sp. nov.

Oval, ziemlich stark gewölbt, Oberseite stark grünlich bronzefarben, der Halsschild meist dunkler, Unterseite schwarz, die Beine dunkelbraun, die Tarsen und ersten Fühlerglieder rotbraun.

Der Kopf ist in beiden Geschlechtern gleich, ungehörnt und ohne Tuberkeln. Die Stirn ist flach oder ganz schwach eingedrückt, zwischen den Augen befinden sich zwei ganz unauffällige, nur bei guter Vergrösserung sichtbare, sehr leichte Schwielen. Die Quernaht ist halbkreisförmig, tief und sehr breit eingedrückt, das Epistom ist kissenförmig gewölbt, die Stirn hat vorn eine grössere Breite als ein Auge von oben gesehen. Die Wangen sind viel schmäler als die Augen, breit verrundet, die verrundeten Ecken sind so weit nach innen gerückt wie die Innenecken der Augen. An den Fühlern sind die ersten drei Glieder rotbraun, vom vierten an schwarz, dieses ist erweitert, so breit wie lang, die folgenden sind quer, reichlich 1.5 mal so breit wie lang. Die Punktierung des Kopfes ist mikroskopisch fein und wenig eng. Das Kinn ist hoch gewölbt, die Augen treten unten dicht an den Maxillarausschnitt, hinter dem Mentum findet sich ein deutlicher, querer Eindruck.

Der Halsschild hat eine vollständige, wenn auch in der Mitte sehr feine Spitzenrandung, der Vorderrand ist, von oben gesehen, deutlich ausgeschnitten, die Vorderecken sind breit verrun-

det, die hinteren sind stumpf, da die Basis jederseits deutlich vorgezogen ist. Die Punktierung ist sehr fein, gleichmässig, nicht eng.

Die Flügeldecken sind einfarbig stark metallisch, die Zwischenräume vollkommen flach bis zur Spitze, wie der Halsschild punktiert. Die Punkte der Reihen sind kräftig, gleichmässig, gegen die Spitze erloschen.

Die Unterseite ist nackt, das Prosternum wagerecht, vorn nicht gekielt, sondern nur stark gewölbt, hinten sehr spitz. Die Propleuren sind auch vorn der Länge nach ausgehöhlt. Das Mesosternum ist scharf und breit V–förmig ausgeschnitten, die Ränder des Ausschnitts sind stark erhaben.

Länge, 5 bis 7 Millimeter; Breite, 3 bis 3.8.

Einige Exemplare in den Sammlungen Veth und Gebien.

Java, Preanger (*P. F. Sijthoff*); Malabar Gebirge, 1,700 Meter; Tjinjiroean, Oktober, 1909 (*van der Weele*).

Diese Art erinnert flüchtig an das gemeine *marseuli,* ist aber wesentlich grösser, hat in beiden Geschlechtern einen einfachen Kopf und vollständig flache Zwischenräume der Decken. Einfachen Kopf haben auch *sauteri, lynceum, coeruleum, sylvestre,* diese haben aber bis auf *coeruleum* mehr oder minder leicht gefurchte Decken und andere Färbung; auch sind die ersten drei viel grösser und haben leicht behaarte erste Abdominalsegmente. *Platydema sylvestre* ist etwas kleiner, gefurcht, hat einen eingedrückten Kopf und rötliche Fühler, während bei unserer Art nur die ersten Glieder rötlich sind.

Platydema recticorne Lewis.

Platydema recticorne Lewis, Ann. & Mag. Nat. Hist. VI 13 (1894) 394.

Glänzend schwarzbraun, ohne Metallglanz, oval, kräftig gewölbt, Unterseite, Rand des Körpers, Fühler, Beine, und Vorderkopf rotbraun.

Der Kopf ist beim Männchen mit zwei gleichen Hörnern versehen, beim Weibchen (nach der Beschreibung) tief grubig eingedrückt, ungehörnt; beim wohlentwickelten Kopf sind die Hörner sehr lang und überragen den Vorderrand des Kopfes weit, sie sind dünn, gerade, parallel, nackt, spitz, von der Seite gesehen bis zum Nacken ganz gerade, unten am Grunde nicht verdickt. Die Stirn ist vorn schmäler als ein Auge von oben gesehen, hinten bei diesem Männchen ausserordentlich tief, lochartig ausgehöhlt. Die Grube ist hinten scharfkantig begrenzt,

die Kante in der Mitte vorgezogen. Das Epistom ist gerade abgeschnitten, in der Mitte mit winzigem Zähnchen versehen. Bei schlechter entwickelten Männchen sind die Hörner kurz, dick, die Grube ist viel flacher, aber auch hier hinten scharfkantig begrenzt mit leicht vorgezogener Mitte dieser Kante, auch das Zähnchen am Clypeus ist immer deutlich. Ein Weibchen habe ich nicht gesehen. Die Fühler sind schon vom vierten Gliede an erweitert, die folgenden sind 1.5 mal so breit wie lang, das letzte ist oval, viel länger als breit. Die Augen treten unten dicht an den Maxillarausschnitt.

Der Halsschild ist viel kräftiger punktiert als bei den meisten andern Arten, besonders an den Seiten, die Punkte stehen nicht eng, die Spitze ist, von oben gesehen, sanft ausgeschnitten, die Vorderecken sind breit verrundet. Die basalen Grübchen sind stark und breit, die Basis ist in der Mitte sanft aufgebogen, an den Seiten nach vorn gezogen, die Hinterecken sind daher sehr stumpf.

Die Flügeldecken sind der ganzen Länge nach tief gefurcht, die Zwischenräume sind kräftig gewölbt, etwas feiner als der Halsschild punktiert. Eine Zeichnung fehlt, doch sind die Ränder heller.

Die Unterseite ist in der Mitte äusserst fein und unauffällig abstehend behaart und kräftig punktiert, besonders an den Seiten. Die Propleuren sind grob punktiert und gerunzelt; das Prosternum ist zwischen den Hüften stumpf gekielt, das Mesosternum scharf ausgeschnitten, die Kanten des Ausschnitts sind schmal und hoch erhaben, die Seiten des Abdomens sind runzlig und kräftig punktiert. Die Tarsen sind sehr lang.

Länge, 4.2 bis 5 Millimeter.

Japan, Kiga, Nikko, Oyayama, Konose, und Hakodate.

In den Sammlungen Berlin, Stettin, und Gebien.

Lewis' Beschreibung ist ungenügend. Nach ihr könnte man glauben nur das Weibchen hätte eine Grube auf dem Kopf, das Männchen nur Hörner; und gerade beim Männchen ist die Grube so tief wie bei keiner andern Art; auch erwähnt er das feine Spitzchen auf dem Epistom nicht, ja bemerkt sogar dass der Vorderkopf halbkreisförmig sei. Dass ich aber die Art richtig deute bezweifle ich nicht, da mir eine Cotype vorliegt. Sie ist mit *marseuli* verwandt, aber nicht metallisch, mit hellen Rändern des Körpers versehen, beim Männchen mit feinen, langen Hörnern, mit ganz anderm Eindruck auf der Stirn; auch sind die Decken stärker gefurcht und der Körper ist schmäler.

Platydema haemorrhoidale Gebien.

Platydema haemorrhoidale GEBIEN, Arch. Natg. Abt. A, Heft 9 79 1913 (1914) 16.

Diese Art sieht auf den ersten Blick dem *P. recticorne* ähnlich, ist aber sehr deutlich metallisch und hat nicht helle Körperränder, sondern nur eine braune Spitze der Decken. Ganz anders ist aber die Bewaffnung des Kopfes beim Männchen; unsere Art ist asymmetrisch gebildet und beim Weibchen ist nicht nur eine Grube vorhanden, sondern auch zwei scharfe Tuberkeln. Einen asymmetrischen Kopf finden wir bei den Männchen vieler gezeichneten Arten, besonders bei der Gruppe *subfascia,* und wie bei dieser Art ist das rechte Horn das grössere, aber es ist nackt, spitz, nicht wie bei *subfascia* zylindrisch, behaart. Das Weibchen unterscheidet sich von *subfascia, sulcipenne,* und *seminitens* ausser durch die Färbung durch eingedrückte Stirn. Bei *sericeum* und *asymmetricum* ist das linke Horn grösser, mit Haarbüschel versehen, auch sind beide nicht metallisch.

Nur von Formosa.

Eine nahe verwandte Art von Sumatra ist der obigen in allen Stücken ähnlich, aber weniger metallisch, die ersten Zwischenräume sind fast flach, das vierte Fühlerglied ist schlanker. Doch wage ich nicht auf das einzige Stück im Museum Dahlem eine neue Art zu gründen.

Platydema capreolum Chevrolat.

Platydema capreolum CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 170, 221, 243.

Die Type dieser Art stammt aus Haag's Sammlung, die jetzt in München aufbewahrt wird, sie lag mir aber unter dem Münchner Material nicht vor. Ich deute also das mir vorliegende Material nach der Beschreibung. Darnach ist die Art mit *P. recticorne* nahe verwandt, aber ohne Spur von Metallschimmer, glänzend schwarz, beim Männchen mit zwei langen Hörnern versehen, beim Weibchen mit scharf rechteckigen Tuberkeln, die Grube auf der Stirn ist hinten nicht scharfkantig begrenzt und der Rand dort nicht vorgezogen. Die Flügeldecken sind gefurcht, aber nicht so tief wie bei *recticorne,* schon das vierte Fühlerglied ist erweitert, das Epistom vorn nicht mit einem Spitzchen versehen. Das Prosternum ist vorn scharf gekielt, aber nicht zwischen den Hüften. Die Propleuren sind leicht gerunzelt und schwach gekielt. Die Hinterschienen wer-

den gegen das Ende deutlich breiter, flach, die Tarsen sind wesentlich kürzer als die sehr schlanken der Art von Japan.

Länge, 4 bis 5 Millimeter.

Ceylon (*Nietner*); Kandy (*W. Horn,* 1899); Puttalam (*Horn,* 1899). India Oriental.

Fünfzehn Exemplare in den Sammlungen Berlin, Stettin, Dahlem, und Gebien.

Platydema higonium Lewis.

Platydema higonium LEWIS, Ann. & Mag. Nat. Hist. VI 13 (1894) 394.

Diese Art hat Lewis kenntlich beschrieben, aber die Unterseite bei der Beschreibung nicht berücksichtigt. Eine Neubeschreibung dürfte nicht überflüssig sein. Sie erfolgt nach einem Pärchen (Cotypen) in meiner Sammlung das ich durch Herrn Blair aus dem Britischen Museum erhielt.

Sehr kurz und gewölbt, von der Gestalt der kurzen *Amarygmus*-Arten, lebhaft goldbraun metallisch, Vorderkopf manchmal etwas purpurfarbig.

Der Kopf hat beim Männchen zwei sehr dünne, lange, wagerechte, bis zum Grunde gleichdicke, am Ende spitze, nackte Hörner, die parallel laufen. Die Stirn zwischen ihnen ist tief grubig eingedrückt und spiegelblank, der Eindruck hinten nicht scharfkantig begrenzt. Beim Weibchen finden sich statt der Hörner zwei scharfwinklige Tuberkeln, auch in diesem Geschlecht ist die Stirn, wenn auch minder tief als beim Männchen eingedrückt, aber deutlich punktiert. Die Augen stehen weit auseinander, so dass ihre Entfernung vorn so gross ist wie die Breite des Epistoms von Ecke zu Ecke, dieses ist viel kürzer als die Stirn vorn breit. Die Fühler sind verhältnismässig dünn, die Glieder nur wenig breiter als lang. Auch auf der Unterseite des Kopfes sind die Augen klein, es bleibt also zwischen diesen und dem Maxillarausschnitt ein breiter Zwischenraum frei.

Der Halsschild ist querüber sehr stark gewölbt, die Seiten fallen fast senkrecht ab, die basalen Eindrücke sind fein und wenig deutlich, die Punktierung ist zwar fein, aber deutlich, die Spitzenrandung auf breite Strecke unterbrochen, die Basis an den Hinterecken vorgezogen, diese sind daher ganz stumpf.

Die Flügeldecken sind auffällig breit, hoch gewölbt, die Seiten fallen sehr hoch senkrecht ab, die Randkante ist von oben ge-

rade noch sichtbar. Die Punktlinien sind flach, nicht eingedrückt, nur der Nahtstreif ist in der letzten Hälfte vertieft, die Punkte sind bis zur Spitze gleichmässig, die ganz flachen Zwischenräume sind sehr fein, aber deutlich punktiert.

Die Unterseite ist in beiden Geschlechtern nackt, nur das Prosternum ist zwischen den Hüften leicht behaart. Dieses ist wagerecht, nach vorn sehr schwach gesenkt, nicht gekielt, ziemlich breit, daher ist der Fortsatz nicht sehr spitz, die Propleuren sind ausgehöhlt, sehr fein längsgestrichelt. Das Abdomen ist stark punktiert und längsstrigos. Die Beine sind kurz, die Hinterschienen zur Spitze deutlich verdickt, an den Hintertarsen ist Glied 1 so lang wie der Rest.

Länge, 5.5 bis 6.5 Millimeter; Breite, 3.8 bis 4.

Japan, Hitoyoshi, Aguma, Rakuwayama.

Platydema marseuli Lewis.

Platydema marseuli Lewis, Ann. & Mag. Nat. Hist. VI 13 (1894) 393.

Platydema nigroaeneum Harold, Deutsche Ent. Zeitsch. 22 (1878) 78; Marseul, Ann. Soc. Ent. Fr. V 6 (1876) 105; Gebien, Saraw. Mus. Journ. 2 (1914) 18; Fairmaire, Ann. Soc. Ent. Fr. VI 8 (1888) 355.

Diese Art ist wesentlich kleiner als *P. nigroaeneum* Motschulsky und findet sich in den Sammlungen meist als dieses bestimmt, ist aber wesentlich breiter. Auch hier ist der Kopf in beiden Geschlechtern tuberkuliert, die Decken sind tief gefurcht, das Prosternum ist vorn gekielt, die Fühlerglieder sind stark quer, fast doppelt so breit wie lang.

Japan, Nagasaki, Kumamoto, Miyanoshita, Kodzusa, Yokohama (*Lewis*). Formosa, Taihorin, Mai, 1910; Chip-Chip, Februar, 1909 (*Sauter*). Burma, Bhamò, 15 August, 1885 (*Fea*). Annam, Phuc Son, November und Dezember (*Fruhstorfer*). Sumatra, Tebing-tinggi (*Schultheiss*); Palembang; Tambang Salida (*Weyers*); Manna (*Knappert*). Java, Bogares Tegal, August, 1889 (*Lucassen*); Preanger (*Sijthoff*); Batavia, Dezember, 1908 (*Jacobson*). Borneo, Kinabalu (*Waterstradt*). Philippinen, Luzon, Laguna, Mount Maquiling (*Baker*); Nueva Ecija; Mount Caraballo (*Schultze*); Rizal, Montalban (*Schultze*).

In den Sammlungen Berlin, Dahlem, Leyden, Veth, Gebien, und Schultze.

Platydema nigroaeneum Motschulsky (nec Harold, Fairmaire).

Platydema nigroaeneum MOTSCHULSKY, Et. Ent. 9 (1860) 18; LEWIS, Ann. & Mag. Nat. Hist. VI 13 (1894) 393.
Platydema musivum HAROLD, Deutsche Ent. Zeitsch. 22 (1878) 78.

Gewöhnlich findet man die vorige Art als *nigroaeneum* bestimmt, die wesentlich kleiner ist und tief gestreifte Decken hat. Die ausführliche Beschreibung Harolds ist schon durch Lewis ergänzt worden auf Grund eines reichen Materials. Die Fühlerglieder sind deutlich, wenn auch schwach quer, das Prosternum ist gekielt, auch zwischen den Hüften, und vorn zwar gesenkt, aber dachförmig.

Japan.

VIERTE GRUPPE

Arten mit mattschwarzer, wie mit feinem Russ bedeckter Oberseite.

Diese Gruppe enthält eine Anzahl einfarbiger, einander sehr ähnlicher Arten, deren Studium wegen der meist ganz ungenügenden Beschreibungen sehr erschwert wird. Die meisten Arten, die hierher gehören, wurden von Motschulsky, Marseul, und Chevrolat (1873–1878) beschrieben, ohne dass ein Autor von dem andern etwas wusste; dass auf diese Weise Synonyme entstanden ist erklärlich, umsomehr als einige Arten, wie *malaccum* und *tricuspis*, eine sehr weite Verbreitung haben und im ganzen indo-malayischen Gebiet vorkommen und bis Neu-Guinea verbreitet sind. Leider kann ich die Synonymie nicht endgültig klarstellen, da mir Typen nur von *moerens* (= *maculicolle*), *laticorne* (= *detersum*), und *umbratum* vorliegen.

Die älteste Art dieser Gruppe ist *P. hemisphaericum*, von der die Autoren eine gute, sehr ausführliche Beschreibung geben. Aus dieser geht hervor, dass das Tier überhaupt keine *Platydema* ist, sondern eine Leiochrinine, aufs nächste verwandt, wenn nicht identisch, mit der bekannten Art die später als *Hades tenebrosus* und *rufolimbatus* beschrieben wurde. Die von Fairmaire beschriebenen Arten *catopioides* und *sericans* sind wahrscheinlich ebenfalls keine *Platydema*, sondern gehören zu den Crypticinen.

Platydema tricuspis Motschulsky.

Platydema tricuspis MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 479 (Männchen).
Platydema reflexum CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 222 (Männchen).
Platydema timorense MARSEUL, Ann. Soc. Ent. Fr. V 6 (1876) 108 (Weibchen ?).

Oval, ziemlich gewölbt, die ganze Oberseite matt sammetschwarz, die Unterseite samt den Epipleuren, die Beine, und die ersten Fühlerglieder rotbraun.

Der Kopf des Männchens ist auf der Stirn breit, aber nicht stark grubig vertieft, die Grube ist hinten bei gut entwickelten Tieren rundlich kantig begrenzt. Die Stirn ist vorn kaum doppelt so breit wie ein Auge von oben gesehen (beim Weibchen etwas breiter); am Innenrand der Augen befindet sich je ein starkes, konisches, senkrecht aufgesetztes Horn, das spitz ist und keinen Haarbüschel trägt. Das Epistom ist in breitem Bogen verrundet und in der Mitte mit spitzer Tuberkel, die ausnahmsweise etwas hornartig ist, versehen. Hörner und Spitze werden allmählich schwächer und sind beim schlecht entwickelten Männchen sehr unauffällig, bei diesen Tieren ist die Grube flacher, hinten nicht kantig begrenzt, immer unpunktiert. Beim Weibchen ist die Stirn flach, oder sehr schwach eingedrückt, deutlich, wenn auch sehr fein punktiert. In diesem Geschlecht fehlen Hörner und Spitze. Die Quernaht fehlt in beiden Geschlechtern. Die Fühler sind vom vierten Gliede an erweitert, die folgenden sind stark quer, das letzte ist an der Spitze braun. Das Kinn ist flach gewölbt, die Augen treten nahe an den Maxillarausschnitt, der Zwischenraum ist kräftig gewölbt, die Kehle ist hart an den Maxillen erhaben gerandet.

Der Halsschild ist querüber bis zum Rand gewölbt, die basalen Grübchen sind sehr undeutlich, auch ist kaum eine Spur von Punktierung vorhanden, die Spitze ist von oben gesehen flach ausgeschnitten, die Vorderecken sind breit verrundet, die hinteren stumpfwinklig, die Basis ist dort kaum vorgezogen. Die äusserst feine Spitzenrandung ist in der Mitte breit unterbrochen.

Die Flügeldecken sind so stark gewölbt dass die Seitenrandkante von oben nicht zu sehen ist. Es sind äusserst feine Punktreihen vorhanden, deren Punkte gut getrennt, übrigens nur bei guter Vergrösserung sichtbar sind und bei frischen Stücken in dem russartigen Ueberzug ganz verschwinden. Der äusserste Streifen in der Seitenrandkehle ist unregelmässig punktiert und hat zwei oder drei Punkte nebeneinander. Die Zwischenräume sind vollkommen flach, ganz unpunktiert.

Die Unterseite ist kahl oder doch nur bei starker Vergrösserung sichtbar, äusserst kurz behaart; das Prosternum ist hinten ziemlich breit, vorn nicht, deutlich gekielt, die Mittelbrust ist am Ausschnitt stark erhaben, das Abdomen mässig fein punktiert, die Propleuren sind vorn flach, nicht ausgehöhlt. Die

Beine sind kurz, die Schienen auch beim Männchen gerade, die Tarsen kurz, an den vorderen ist das erste Glied beim Männchen nicht verdickt, an den hinteren ist Glied 1 etwas länger als 2 + 3.

Länge, 5 bis 7.2 Millimeter.

Ueber 100 Exemplare in fast allen Sammlungen.

Indien, Patadalu; Madras. Burma, Bhamò, Juni, 1885 (*Fea*). Andamanen, Malacca (*v. Roepstorff*). Sumatra, Manna (*Knappert*); Siboga, Oktober, 1890, bis März, 1891 (*Modigliani*); Tebing-tinggi (*Schultheiss*); Serdang; Tandjong Morawa (*Hagen*). Mentawei, Si-Oban, April bis August, 1894 (*Modigliani*). Java, Semarang, Juni, 1896; September, 1905 (*Drescher*); Bogares Tegal, Juli, 1889 (*Lucassen*). Philippinen, Mindanao, Zamboanga (*Baker*). Banguey bei Borneo. Sumbawa (*W. ten Kate*). Key-Inseln. Neu-Guinea, Dorey. Australien, Cap York: Coen-Distrikt (*Hacker*).

Diese weit verbreitete Art ist naturgemäss etwas variabel: die Stücke des papuanischen Gebietes (von den Key-Inseln und Dorey) sind wesentlich grösser und haben eine sehr dunkle Unterseite, die Tiere von den Andamanen ganz gelbe Fühler.

Von allen mattschwarzen Arten ist unsere sofort durch den dreispitzigen Kopf des Männchens verschieden und daher mit keiner zu verwechseln, da keine andere gehörnt ist. Das Weibchen ist dem *P. velutinum* ausserordentlich ähnlich, unterscheidet sich aber durch das vierte quere Fühlerglied, während es bei *velutinum* konisch ist, durch rotbraune Unterseite und viel gröber punktierten Abdomen.

Dass *tricuspis* und *reflexum* artlich zusammen gehören ist nicht zu bezweifeln, ob aber auch *timorense* als Weibchen hierher gehört muss eine spätere Konsultation der Typen ausweisen. Die Beschreibung lautet:

Platydema timorensis.—Une espèce de Timor, d'une taille bien inférieure (6.5 sur 3 mill.) se reconnait à sa couleur noir opaque enfumé en dessus, noir brun luisant en dessous, palpes bouche, antennes et pattes rouge ferrugineux: à ses antennes courtes, composées d'articles transverses comprimés à partir du 5e, à pronotum pointillé, biimpressionné pres de la base, à peine arqué sur les côtés avec les angles saillants obtus, ò élytres assez fortement striées ponctuées, avec interstries convexes en dehors; abdomen fortement ponctue.

Abweichend von unserer Art ist, falls die Beschreibung richtig ist, dass die Fühler vom fünften Gliede an erweitert sein sollen und die Zwischenräume gewölbt.

Platydema umbratum Marseul.

Platydema umbratum MARSEUL, Ann. Soc. Ent. Fr. V 6 (1876) 107.

Diese Art scheint in den deutschen Sammlungen selten zu sein; mir liegen nur zwei Stücke aus meiner eigenen vor, davon ist das eine von Lewis selbst gesammelt und bestimmt; die von Marseul angegebene Grösse von 10 Millimeter wird durch dieses Tier, das 12 Millimeter misst, übertroffen. Marseul's Beschreibung ist sehr eingehend, sie ist die beste aller von den älteren Autoren verfassten. Die Hauptmerkmale sind die folgenden: Beide Geschlechter ungehörnt, Stirn etwas breiter als ein Auge, die Quernaht tief eingedrückt, vor den Augen befindet sich ein kräftiges Grübchen, Fühler lang und dünn, die Glieder vom vierten an dreieckig, so breit wie lang, die Ecken des Halsschildes sind rechtwinklig, die vorderen ragen, von oben gesehen, spitz vor. Die Streifen der Flügeldecken sind fein, aber deutlich vertieft, die Zwischenräume daher etwas gewölbt, die Punkte in den Streifen stehen eng, die Randkehle ist unordentlich mehrreihig punktiert. Das Prosternum ist zwischen den Hüften jederseits deutlich gerandet, vor den Hüften eingedrückt, nicht gekielt oder dachförmig. Die Propleuren sind auch vorn kräftig ausgehöhlt, sehr fein und lang, oberflächlich längsrunzlig. Das Mesosternum ist sehr breit dreieckig, nicht V-förmig ausgeschnitten, die Kante nicht sehr scharf, oben nicht erhaben gerandet. Das Abdomen ist kräftig punktiert und fein längsstrichelig. Die Beine sind schlank, die Schienen dünn, beim Weibchen gerade, beim Männchen sind die mittleren wie bei *maculicolle* gebogen, das erste Glied der Vordertarsen ist beim Männchen kräftig vergrössert. Leider lag mir kein Männchen vor.

Länge, 10 bis 12 Millimeter.

Japan, Nagasaki.

Platydema maculicolle Castelnau und Brulle.

Platydema maculicolle CASTELNAU und BRULLE, Ann. Sc. Nat. (1829) 374 (sep. p. 50).

Platydema moerens PERTY, Col. Ind. Or. München (1831) 40.

Gross, regelmässig oval, kräftig gewölbt, matt schwarz, mit russartigem Ueberzug bedeckt, selten matt glänzend, der Halsschild meist mit mehr oder minder grossem, dunkelrotem Scheibenfleck. Der Kopf ist blank, Unterseite und Beine glänzend schwarzbraun, Beine zuweilen ganz schwarz, die ersten beiden Fühlerglieder rotbraun.

Der Kopf ist ganz flach, in beiden Geschlechtern ohne Hörner oder Tuberkeln, die Stirn ist vorn so breit wie ein Auge von oben gesehen, beim Männchen etwas breiter, die Augen sind stark schräg nach vorn gerichtet. Die Quernaht ist nicht eingedrückt und nur bei guter Vergrösserung als sehr feine eingeschnittene Linie zu erkennen. Das Epistom ist gerade abgestutzt, die stumpfen Ecken liegen ungefähr vor der Mitte der Augen, das Epistom ist vor den Augen ungefähr so lang wie die Stirn vorn breit. Die Fühler sind in beiden Geschlechtern etwas verschieden, Glied 3 ist doppelt so lang wie an der Spitze dick, schwach konisch, auch das vierte ist an der geraden Hinterkante viel länger als breit, 5 beim Männchen so breit wie lang, die folgenden werden allmählich stärker quer, auch das schiefe letzte Glied ist etwas quer, an der Spitze fast gerade, schräg abgestutzt. Beim Weibchen ist schon das fünfte Glied etwas quer und die folgenden sind wesentlich breiter. Die Punktierung ist sehr fein, gleichmässig, deutlich. Auf der Unterseite des Kopfes treten die Augen ziemlich nahe an den Maxillarausschnitt, der Raum zwischen beiden ist innen stark, scharfkantig erhaben. Das Mentum ist sanft gewölbt, die Kehle ist hinter den Mundteilen kaum eingedrückt.

Der Halsschild hat in der Regel einen hellbraunen Fleck von ziemlicher Grösse, zuweilen nimmt er den grössten Teil der Scheibe ein, nicht selten fehlt er ganz. Der Vorderrand ist in breitem Bogen kräftig ausgeschnitten, die Ecken sind also, von oben gesehen, weit vorgezogen, in der Randkante scharf recht- oder etwas stumpfwinklig, die hinteren sind ganz kurz verrundet rechtwinklig, die Basis ist dort nicht nach vorn gezogen wie bei den meisten metallischen oder gezeichneten Arten. Die basalen Grübchen sind ganz undeutlich, flach, rundlich, eine Punktierung ist bei normal matten Tieren nicht sichtbar, aber bei abgeriebenen blanken wird sie in der Gegend der basalen Grübchen recht deutlich, fehlt aber auf der Scheibe ganz.

Die Flügeldecken sind ziemlich stark gewölbt, so dass die Seitenrandkante in der vorderen Hälfte von oben entweder überdeckt wird oder gerade noch sichtbar ist, hinten ist sie breit zu sehen. Bei frischen, matten Stücken sind die Punktlinien von ausserordentlicher Feinheit, ihre Punkte nur bei starker Vergrösserung sichtbar, die Zwischenräume sind ganz flach, auch an der Spitze; die gröbere Punktreihe der Seitenrandkehle ist einfach.

Die Unterseite ist in beiden Geschlechtern nackt, das Prosternum ist vorn sanft und gleichmässig gesenkt, nicht gekielt, die

Vorderrandlinie ist sehr fein, die Platte ist wagerecht, nicht gefurcht, die Propleuren sind flach oder sanft ausgehöhlt. Die Mittelbrust ist scharf V-förmig ausgeschnitten, die Ecken sind scharf stumpfwinklig, die Partie oben neben dem Ausschnitt ist deutlich gekielt. Das Abdomen ist fein punktiert, die beiden vorletzten Segmente sind nicht quer gefurcht.

Die Beine sind dick, beim Männchen wesentlich anders als beim Weibchen. Die Mittelschenkel des Männchens auf der Unterkante nicht gerade, sondern zuerst sehr leicht ausgeschnitten und im letzten Drittel plötzlich fast winklig gerundet verengt, die Unterkante der ersten zwei Drittel ist sehr kurz, dick, goldgelb behaart; ähnlich gebildet sind die Hinterschenkel, doch fehlt hier eine Behaarung. Die Vorderschienen des Männchens sind kaum gebogen, die mittleren zuerst sehr dünn, dann stark nach vorn gekrümmt, gegen das Ende stark verdickt, auch die hinteren sind kräftig gekrümmt, aber nach dem Ende zu nicht so stark verdickt. Die Tarsen sind lang, an den vorderen ist das erste Glied etwas grösser als die andern. Beim Weibchen sind Schenkel, Schienen, und Vordertarsen einfach.

Länge, 8.3 bis 11.1 Millimeter; Breite, 4.3 bis 5.8.

Achtundvierzig Exemplare in den Sammlungen Berlin, Stettin, Dahlem, München (Type von *P. moerens* !), Dresden, Leyden, und Gebien.

Java, Preanger, 1,000 bis 2,000 Meter; Malang (*A. Koller*); Pengalengan, 4,000 Fuss (*Fruhstorfer*); Toegoe; Poentjak-Megamendoenk (*Pasteur*); Goenoeng Salak, September, 1907 (*Jacobson*).

Platydema maculicolle scheint auf Java beschränkt zu sein, während die sehr ähnliche folgende Art weit verbreitet ist. Der rötliche Fleck auf dem Halsschild, den Castelnau und Brulle und Perty als Artmerkmal auffassten, fehlt nicht selten, solche Tiere sind den *P. malaccum* sehr ähnlich, aber grösser, glatter, die Stirn ist vorn nicht quer eingedrückt, der Fühlerbau ist anders, die Streifen sind äusserst fein punktiert und die Decken viel stärker gewölbt.

Platydema detersum (Walker).

Crypticus detersus WALKER, Ann. & Mag. Nat. Hist. III 2 (1858) 284.
Platydema annamitum FAIRMAIRE, Ann. Soc. Ent. Fr. (1893) 24.
Platydema laticorne FAIRMAIRE, Notes Leyd. Mus. 4 (1882) 222.
Platydema malaccum MARSEUL, Ann. Soc. Ent. Fr. V 6 (1876) 108.

Vor mir liegt nur die Type von *P. laticorne*, die Identifizierung der andern Arten erfolgt nach der Beschreibung und brieflicher

Mitteilung durch Herrn Blair, doch bezweifle ich nicht dass die angegebene Synonymie richtig ist. Die Deutung von *malaccum* stimmt überein mit Bates' Auffassung der Art, von ihm liegt ein Exemplar in der Münchner Sammlung vor. Es könnte auffallen, dass Fairmaire seine eigene ältere Art später nicht wieder erkannt haben soll. Aber das ist bei ihm keineswegs eine vereinzelt vorkommende Erscheinung.

Da weder Marseul noch Fairmaire das Männchen beschreiben, auch die Beschreibungen sonst dürftig genug sind, erfolgt eine Neubeschreibung nach einem reichen, mir vorliegenden Material.

Ziemlich breit oval, verhältnismässig flach, oben ganz mattschwarz, Unterseite blank, schwarz oder dunkelbraun, die Beine meist schwarz, selten (var. *rubripes*) sind Beine und Unterseite rot.

Der Kopf ist glänzend, in beiden Geschlechtern ungehörnt und ohne Tuberkeln, flach, aber die Stirn und das Epistom sind einzeln gewölbt und durch einen kräftigen, gebogenen Quereindruck getrennt, der nie fehlt. Der Vorderkopf ist sehr kurz, vor den Augen viel kürzer als die Stirn vorn breit, diese ist so breit oder etwas breiter als ein Auge von oben gesehen. Die Punktierung ist wie bei voriger Art fein, gleichmässig, aber deutlich, hinten auf der Stirn befindet sich nicht selten ein feiner Eindruck. Die Ecken des Epistoms sind ziemlich deutlich, die Fühler sind dick, vom vierten Gliede an erweitert, dieses ist so breit wie lang, die folgenden werden stärker quer, die vorletzten sind reichlich 1.5 mal so breit wie lang, das letzte ist quadratisch mit runden Ecken, aber in der Gestalt etwas veränderlich, nicht selten ist die innere Endspitze deutlich, die Aussenkante ganz verrundet. Auf der Unterseite befindet sich zwischen Augen und Maxillen ein schmaler Zwischenraum, der innen stark kantig erhaben ist. Das Kinn ist flach gewölbt, der quere Eindruck kräftig.

Der Halsschild ist sehr fein punktiert, besonders in den ganz flachen, rundlichen, breiten Basalgrübchen, die Punktierung ist in der Regel deutlich, viel deutlicher als bei voriger Art, nur bei ganz frischen, mit russartigem Ueberzug versehenen Stücken ist sie in der Bedeckung fast erloschen. Die Seiten sind in der Endhälfte meist parallel, daher erscheinen sie sehr stark gerundet, seltener ist die Verengung schon von der Basis an deutlich, wenn auch sehr schwach. Der Vorderrand ist kräftig ausgeschnitten, die Ecken ragen von oben gesehen vor und sind in der Randkante ziemlich scharf recht- oder etwas stumpf-

winklig, ebenso sind die hinteren kurz verrundet, rechtwinklig, da die Basis bei den Hinterecken nicht vorgezogen ist.

Die Flügeldecken sind verhältnismässig flach, die Seitenrandkante ist auch vorn stets von oben breit sichtbar. Es sind gut ausgebildete Punktstreifen vorhanden, deren Punkte kräftig entwickelt und sehr deutlich sind. Die Zwischenräume sind sehr schwach, aber deutlich gewölbt, so dass die Streifen, besonders hinten, leichte Furchen bilden.

Die Unterseite ist schwärzlich oder bräunlich, nackt, das Prosternum zeigt nur unmittelbar neben den Hüften ganz leichte Furchen, es ist flach, vorn etwas dachförmig, aber nicht eigentlich gekielt. Die Propleuren sind sehr leicht und oberflächlich längsrunzlig. Der Ausschnitt des Mesosternums ist breit V-förmig, die Ecken sind sehr stumpf, fast verrundet, das Abdomen ist deutlich punktiert und fein längsrunzlig. Die Beine sind wie bei *maculicolle* gebildet: die Mittelschienen sind beim Männchen sehr stark gekrümmt, zuerst dünn, dann verbreitert, etwas schwächer die Hinterschienen. Die Mittelschenkel haben auf der Unterseite von der Basis bis zur Mitte einen feinen Haarbesatz, der sehr kurz und wenig auffällig ist.

Länge, 6.3 bis 9.8 Millimeter; Breite, 3.1 bis 5.1.

Dreiundachtzig Exemplare; in allen Sammlungen vertreten.

Ceylon (*Nietner*). Aborland, Rotung, 1,400 Fuss, 24 bis 28 Dezember, 1911, unter Rinde und in faulem Holz (*Kemp* leg.). Burma, Bhamò, August, 1886 (*Fea*); Malacca, Pulo Penang; Singapore. Annam, Phuc Son (*Fruhstorfer*); Pha-Rang. China, Ou-hou. Formosa, Taihorin, November, 1909; Chip Chip, Februar, 1909; Kosempo, Februar, 1910 (*Sauter*). Penang (*Baker*). Sumatra, Residentschaft Palembang (*Knappert*); Manna (*Knappert*); Deli, Siboelangit (*Jachan*); Palembang: Boenga mas (*van Hasselt*); Deli (*J. H. Spitzly*); Padang sidemp (*Spitzly*); Siboga, Oktober, 1890, März, 1891 (*Modigliani*). Java, Batavia, Dezember, 1908 (*Jacobson*); Bogares Tegal, August, 1889 (*Lucassen*); Buitenzorg, 24ten Februar bis 12ten August, 1904 (*Kraepelin*). Borneo, Kinabalu (*Waterstradt*); Banguey bei Borneo (*W. Kedenburg*). Philippine, Palawan, Puerto Princesa (*Baker*); Philippinen (*Hallier*), Luzon, Benguet, Baguio; Laguna, Los Baños (*Baker*). Sumbawa (*v. Lansberg*). Celebes, Bonthain (*Ribbe*). Neu-Guinea, Rosensee, 10ten Februar, 1913 (*Burgers*); Finschhafen (*Rohde*); Hatzfeldhafen (*Grabowsky*). Neu-Süd Wales, Sidney; Queensland; Glen Lamington (*Mjöberg*), Malanda (*Mjöberg*).

Platydema detersum var. rubripes var. nov.

? *Platydema holosericeum* MARSEUL, Ann. Soc. Ent. Fr. V 6 (1876) 108.

Von den Andamanen (Museum Berlin, Sammlung Gebien) und von Calcutta (Museum Stettin) liegen mir sechs Exemplare vor, die sich von der Stammform übereinstimmend durch rotbraune Unterseite und ganz rote Beine unterscheidet.

Diese sehr weit verbreitete Art ist mit *P. maculicolle* und *umbratum* verwandt und bildet mit beiden eine besondere Gruppe innerhalb der Gattung, ausgezeichnet durch die eigentümliche Krümmung der Mittel- und Hinterschienen beim Männchen. Von *maculicolle*, das ihm am nächsten steht, unterscheidet sie sich durch den viel flacheren Körper dessen Seitenrandkante von oben der ganzen Länge nach sichtbar ist, die starken Punkte der Deckenstreifen, der einfarbige Halsschild, die deutlich gewölbten Zwischenräume, und die schon vom vierten Gliede an erweiterten Fühler. *Platydema umbratum* ist viel grösser, hat ganz andere Fühler und ein breit ausgeschnittenes Mesosternum, es vertritt unsere Art in Japan. Kleine Exemplare sehen übrigens den Weibchen von *P. tricuspis* ähnlich, unterscheiden sich aber durch nur halb so breite Stirn, viel flacheren Körper und schwarze Epipleuren.

Durch eine Notiz von Herrn Blair ist die Synonymie dieser Art besonders geklärt worden. Er sendet mir einige Tiere dieser Art mit der Bemerkung: "*Platydema* (*Crypticus*) *detersum* Walk. (typ. comp.) = *malaccum* Mars. (typ. c.) = *annamitum* Frm. = *Ceropria salga* Pasc. (typ. comp.)."

Platydema velutinum Walker.

Platydema velutinum WALKER, Ann. & Mag. Nat. Hist. III 2 (1858) 283.

Platydema tarsale CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 210.

Walker's Beschreibung lautet:

Diaperis velutina: Nigra, velutina ore fulvescente, antennis piceis, basi ferrugineis, corpore subtus pedibusque piceis aut ferrugineis.
L. 2½–3 lin.

Man wird zugeben dass sie auch bescheidenen Ansprüchen nicht genügen kann, eine Neubeschreibung dürfte daher wertvoll sein. Leider liegen mir nicht die Typen vor und nur darum beziehe ich das reiche mir vorliegende Material auf *velutinum* weil es sich um die häufigste mattschwarze Art auf Ceylon von der angegebenen Grösse handelt.

Ziemlich breit oval, mässig gewölbt, oben ganz mattschwarz, die ersten Fühlerglieder, die Taster, und Tarsen rotbraun, Unterseite und Beine schwarzbraun.

Der Kopf ist in beiden Geschlechtern ungehörnt, die Stirn flach, vorn ungefähr doppelt so breit wie ein Auge von oben gesehen, die Quernaht vorn ist gut ausgeprägt, sie ist eine glänzende, feine, halbkreisförmig gebogene Linie, die weit vom Vorderrand der Augen entfernt ist. Die Ecken des Epistoms sind breit verrundet und liegen ungefähr vor der Mitte der Augen. Auf der Stirn finden sich beim Männchen zwei sehr kleine, unauffällige, rundliche Tuberkeln, die beim Weibchen meistens fehlen oder aber kaum angedeutet sind. Die Fühler sind kräftig, Glied 4 ist etwas länger als 3, konisch, länger als breit, von 5 an sind die Glieder verbreitert, das letzte so lang wie breit. Auf dem Unterkopf treten die Augen dicht an den Maxillarausschnitt und sind von ihm durch einen schmalen, stark gewölbten, innen scharfkantigen Zwischenraum getrennt, hinter dem Kinn findet sich ein kräftiger, schmaler Quereindruck.

Der Halsschild ist in beiden Richtungen kräftig gewölbt, besonders die Seiten vorn sehr stark, so dass der Seitenrand von oben gerade noch sichtbar ist. Die Seiten sind von der Basis an verengt, die basalen Grübchen sind sehr flach und undeutlich, eine Punktierung fehlt meist ganz, das heisst, ist in dem russartigen Ueberzug versteckt, bei mehr abgeriebenen Stücken finden sich in der Gegend der Basalgrübchen sehr feine Punkte, die Vorderecken ragen schwach vor und sind breit verrundet, die Hinterecken sind kurz verrundet stumpfwinklig, die Basis ist dort nicht deutlich vorgezogen.

Die Flügeldecken fallen an den Seiten fast senkreckt ab, doch ist die Randkante von oben ganz zu sehen. Die Punkte der Streifen sind kräftig, auch bei frischen Stücken sehr deutlich, recht weitläufig, so dass zwischen je zwei Punkten Platz für ungefähr drei weitere ist, die Seitenrandkehle hat eine einzige Reihe von Punkten, die etwas stärker als die andern sind.

Das Prosternum fällt vorn einfach dachförmig ab, die Propleuren sind kaum wahrnehmbar lang und undeutlich längsrunzlig, vorn flach, die Mitte ist jederseits zwischen den Hüften deutlich gefurcht. Das Abdomen ist kräftig punktiert, das letzte Segment am Grunde deutlich quer gefurcht. Die Beine sind beim Männchen und Weibchen gleich, die Hinterschenkel sind dick, die Schienen gerade, an den Vordertarsen der Männchen ist Glied 1 deutlich dicker als die andern.

Länge, 5.5 bis 7 Millimeter; Breite, 3.2 bis 3.8.

Ueber 100 Exemplare in den Sammlungen Berlin, Dahlem, Stettin, Gebien, und bei Staudinger und Bang-Haas.

Ceylon (*Nietner*); Negombo, Puttalam, Nalanda, Anardadhapura (alle von *Horn*, 1899, gesammelt).

Diese Art ist leicht zu verwechseln mit kleinen Stücken von *P. detersum* das ebenfalls auf Ceylon vorkommt, aber sicher zu unterscheiden durch die doppelt so breite Stirn, den matten Kopf, und den gewölbten Halsschild mit breit verrundeten Vorderecken. Auch *P. tricuspis* ist im weiblichen Geschlecht sehr ähnlich, hat ebenfalls die breite Stirn, aber immer eine rotbraune Unterseite mit roten Epipleuren, besonders aber sind die Fühler anders, da schon das vierte Glied erweitert ist, während es bei unserer Art konisch ist, und durch die mehrfache Randreihe von Punkten, überdies sind die Zwischenräume vollkommen flach, bei *velutinum* leicht gewölbt.

Nicht ohne Bedenken ziehe ich *P. tarsale* Chevrolat hierher, da mir die Type nicht vorgelegen hat; die Beschreibung der Färbung würde besser auf das Weibchen von *tricuspis* passen, wenn der Autor nicht ausdrücklich sagte dass die Fühler vom fünften Gliede an erweitert wären.

Platydema formosanum sp. nov.

Von der Gestalt des *P. malaccum*, aber kleiner, kräftig gewölbt, oben mattschwarz, unten glänzend schwarz, selten schwarzbraun, die Beine, die Taster, und die ersten drei Fühlerglieder rotbraun oder rötlich, das letzte Fühlerglied an der Spitze heller.

Der Kopf ist in beiden Geschlechtern gleich, auf der Stirn finden sich also beim Männchen keine rundlichen Tuberkeln, sie ist flach, vorn fast doppelt so breit wie ein Auge von oben gesehen, matt, fein, aber sehr deutlich punktiert, die Querfurche ist halbkreisförmig, nicht sehr tief; vor den Augen befindet sich kein grubiger Eindruck. An den Fühlern ist Glied 4 so breit wie lang, oder etwas länger, dreieckig, die folgenden sind quer, die vorletzten 1.5 mal so breit wie lang. Der Raum zwischen Augen und Maxillarausschmitt ist stark gewölbt, innen gerandet. Hinter den Mundteilen findet sich ein kräftiger Quereindruck. Der Halsschild ist von der Basis an verengt, die Hinterecken sind sehr kurz verrundet rechtwinklig, die Vorderecken treten, von oben gesehen, schwach vor und sind breit verrundet. Die Punktierung ist bei gut erhaltenen, berussten Stücken nicht sichtbar, bei etwas abgeriebenen nur in der Gegend der Basalgrübchen deutlich.

Die Flügeldecken fallen an den Seiten senkrecht ab, ihre Randkante ist aber von oben sichtbar. Die Punktreihen sind schwach vertieft, die Zwischenräume fast flach, die Punkte in den Reihen sind dicht, der Abstand ist etwas grösser als der Durchmesser eines Punktes, so dass kaum zwei Punkte in dem Raum Platz haben. Die Randreihe ist fast einfach, ihre Punkte sind nicht grösser, sondern meistens etwas feiner als die der andern Streifen, zwischen Randstreifen und Kante finden sich nur vereinzelt sehr feine Punkte.

Die Unterseite ist nackt, das Prosternum nicht deutlich gefurcht, es fällt vorn einfach, schräg, etwas dachförmig ab. Die Propleuren sind vorn flach, sehr schwach längsrunzlig. Der Ausschnitt des Mesosternums ist V-förmig, die Kante des Ausschnitts ist scharf und innen erhaben. Das Abdomen ist kräftig punktiert und längsgerunzelt, das letzte Segment ist an der Basis mit querer, gerader Linie versehen. Die Schienen sind in beiden Geschlechtern gerade, das Männchen hat an den Vordertarsen ein kräftig verdicktes erstes Glied, an den Hintertarsen ist Glied $1 = 3 + 4$.

Länge, 5.6 bis 6.3 Millimeter; Breite, 3 bis 3.6.

Neunzehn Exemplare im Museum Berlin und in meiner Sammlung. Formosa, Hoozan, September, 1910 (*Sauter*).

Diese Art ist dem *P. velutinum* von Ceylon sehr ähnlich, aber etwas schmäler und durchschnittlich etwas kleiner, im männlichen Geschlecht durch die einfache, nicht mit zwei Tuberkeln versehene Stirn zu unterscheiden. Ferner stehen die Punkte der Decken viel enger als bei der Art von Ceylon und die ganzen Beine sind rötlich.

Es ist nicht ausgeschlossen dass diese Art mit *P. fumosum* aus Japan oder *fuscicorne* aus Malacca zusammenfällt. Beide Beschreibungen sind ganz ungenügend. Lewis' Beschreibung lautet:

Platydema fumosum.—Ovale, atrum, opacum; antennis articulis primo et secundo tarsisque rufis. L. 6¼ mill.

Oval, densely black, opaque; the head finely and sparingly punctured, semicircular anteriorly; the thorax arched at the sides, bisinuous behind, punctured like the head, the scutellum triangular: the elytra, striae fine and punctulate, interstices flat, the antennae, two basal joints red, the others black; the legs dusky brown, tarsi reddish, basal joints of the anterior tarsus of the male slightly enlarged. Head not cornute in either sex.

Diese Beschreibung passt auf unsere Art, doch sollen die beiden ersten Fühlerglieder und die Tarsen rot sein, während

bei *formosanum* die drei ersten Fühlerglieder und die ganzen Beine rötlich sind, ferner soll der Kopf wie der Halsschild punktiert sein; das ist aber bei unserer Art nicht der Fall.

Platydema fuscicorne Chevrolat.

Platydema fuscicorne CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 222.

Long 6½ et 4½ mm. Ovale, convexum, tomentosum, atrum; ore, palpis tribusque primis art. antennarum rufis, sequentibus semirotundatis, apice truncatis, nigrofuscis, ultimo apice albicante, ad apicem prothoracis limitato: capite plano, subtruncato, inter oculos lineolis 3 longitudinalibus, sulco transverso antice junctis; prothorace transverso, antice profunde emarginato, postice supra scutellum late sed modice lobato, lateribus rotundato, antice angustato: angulis posticis obtuse rectangulari; scutellum triangularis, elytri nigro-opacis, tomentosis, striis obsolete striatis, interstitiis convexiusculis, nigricantibus. Ind. or. (Malacca) Haag.

La forme etroite et allongée du corps la distingue de la plutart des espèces indiennes.

Diese Art soll viel schlanker sein als die andern indischen Arten, das ist aber *formosanum* nicht (übrigens wäre nach den angegebenen Massen das Tier viel breiter als irgend eine andere). Die Stirn soll drei feine Längslinien haben, die unserer Art fehlen, und die Tarsen allein sind rötlich, während bei der Art von Formosa die ganzen Beine rot sind. Ich ziehe es also vor unsere Art als neu zu beschreiben, anstatt eine ganz zweifelhafte Synonymie einzuführen.

MIR UNBEKANNT GEBLIEBENE UND NICHT GEDEUTETE ARTEN

Platydema catopioides Fairmaire.

Platydema catopioides FAIRMAIRE, Ann. Soc. Ent. Belg. 40 (1896) 24.

Long 3¼ mill. Ovato oblonga, postice attenuata, piceo-fusca, vix nitidula, prothorace paulo magis piceo, antennis, palpis pedibusque testaceo-rufulis; capite subtilissime dense punctulato, antice transversum impresso; prothorace amplo, basi late sinuato et elytrorum basin amplectante, angulis fere rectis, dorso subtilissime vix perspicue punctulato; scutello brevi, obtuso, nitidulo; elytris ovato-oblongis, postice leviter attenuatis, subtiliter punctulato-striatulis, intervallis planis, fere indistincte punctulati; subtus obscure rufescens pilosula.

Belgaum (Ind. or.), 2 individus en avril.

Cette espèce est remarquable par sa forme qui rappelle tout à fait cela du *Catops sericeus;* sa coloration est presque la même.

Die hinten verschmälerte Gestalt, und der den Flügeldecken ausschliessende Halsschild mit rechtwinkligen Hinterecken lassen in dieser Art eine Crypticine vermuten.

Platydema sericans Fairmaire.

Platydema sericans FAIRMAIRE, Ann. Soc. Ent. Belg. 40 (1896) 24.

Long 2½ mill. Ovata, postice leviter attenuato, modice convexa, fusco-picea, elytris sat dense subtiliter griseo-pubescentibus, subtus cum pedibus antennisque obscure rufa; capite aequali, antennis prothoracis basin fere attingentibus; prothorace transverso, elytris haud angustiore, antice parum angustato, margine postico utrinque levissime sinuato, angulis rectis; scutello truncatulo; elytris fere a basi leviter attenuatis, apice rotundatis, dorso subtiliter striatulo-punctulatis, striis suturam versus paulo magis distinctis, intervallis planis, fere levibus; subtus pubescens.

Belgaum; assez commun, mars et avril, volant à la lampe le soir.

Ressemble un peu à *catopioides*, mais plus courte, plus petite, le corselet moins ample, n'embrassant pas la base des élytres, avec le bord postérieur presque droit.

Sollte diese Art wirklich zu *Platydema* gehören (sie ist aber wahrscheinlich eine Crypticine), so müsste sie an der feinen Behaarung der Oberseite leicht kenntlich sein.

Platydema hieroglyphica Fairmaire.

Platydema hieroglyphica FAIRMAIRE, Ann. Soc. Ent. Belg. 40 (1896) 25.

Long 4 mill. Ovata, postice leviter attenuata, fusca, nitidula, elytris rufo-testaceis, lituris fuscis brevibus, sat irregularibus interdum confluentibus signatis, striis basi infuscatis; capite subtilissime dense punctulato, antice transversim levissime impresso, palpis antennisque piceolis, his apice dilutioribus, articulis 5 ultimis crassioribus; prothorace valde transverso, longitudine duplo latiore, elytris haud angustiore, antice a basi angustato, basi leviter bisinuato et anguste, cum laterum basi, rufescente; elytris parum fortiter punctulato striatis, intervallis planis, laevibus, lituris fuscis basi interdum latioribus; subtus fusca, pedibus piceis.

Belgaum.

Ressemble à la *P. undulata* W., mais bien plus grande, un peu plus longue, les élytres à dessins noir ne formant pas de fascies, bien plus nombreux, et à stries bien marquées.

Auch diese Art kann nicht zu *Platydema* gehören, wie die Angabe das nur die letzten fünf Fühlerglieder erweitert sind beweist. Die verglichene Art, *P. undulatum* Westwood, ist nie beschrieben worden. Fairmaire hat aber dem Leydener Museum den *Microcrypticus scriptipennis* als diese Art bestimmt und in diese Gattung wird auch die vorliegende Art gehören.

Platydema semirufa Fairmaire.

Platydema semirufa FAIRMAIRE, Ann. Soc. Ent. Belg. 40 (1896) 25.

Long 3¾ mill. Oblongo-ovata, parum convexa, postice leviter angustata, rufa, opaca, elytris fuscis, utrinque plaga magna axillari testaceo-rufa, suturam haud attingente; capite obscuriore, utrinque fortiter impresso et

supra transversim plicatulo, antennis corporis medium superantibus, crassiusculis, articulis 6 ultimis crassioribus; prothorace amplo, elytres fere latiore margine postico fere recto, ante angulos vix sinuato, his fere rectis; elytris punctato-lineatis, punctis dense, intervallis planis, subtilissime punctulatis; subtus cum pedibus rufa, prosterno dense punctato.

Belgaum, un seul individu.

Ressemble beaucoup à *caesifrons* d'Egypte, mais plus grande, a élytres différemment colorées, semblement striées, et avec les antennes plus fortes.

Die zum Vergleich herangezogene Art *P. caesifrons* ist, wie ich mehrfach angeführt habe, eine Crypticide, und gehört in die neue Gattung *Cechenosternum* Gebien.

Platydema polyspila Fairmaire.

Platydema polyspila FAIRMAIRE, Ann. Soc. Ent. Belg. 40 (1896) 25.

Long 2⅔ mill. Oblongo-ovata, postice vix angustior, modice convexa, picea, nitidula, subtiliter pubescens, capite antice, prothorace basi et lateribus anguste rufescentibus elytris vittulis brevibus rufis signatis, antennis, palpis, pedibusque rufescentibus; capite vix perspicue punctulato, antice transversim impressiusculo, clypeo levissime sinuato, antennis breviusculis, ante prothoracis basin abbreviatis; prothorace trapezoidali, elytris vix angustiore, antice a basi angustato, margine postico utrinque late sinuato, angulis fere rectis, dorso densissime subtiliter punctulato; scutello similiter punctulato, fere truncato; elytris postice tantum angustatis, modice punctato-substriatis, intervallis planis, vix perspicue punctulatis.

Belgaum, mars et mai pendant les pluies.

Ressemble assez à *hieroglyphica*, mais plus petite avec les élytres plus courtes, nettement striolées, à coloration fonciére brune avec les linéoles courtes roussâtres.

Platydema ochracea Motschulsky.

Platydema ochracea MOTSCHULKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 471.

Statura *Pl. violacea* sed plus quadruplo minor, ochraceo-testacea, ore palpis, antennarum basi pedibusque dilutioribus, oculis nigris; fronte inter oculos impresso, punctato; thorace transverso, subtiliter punctato, basi bisinuato, angulis posticis acutis, subprominulis; elytris fere thoracis latitudine, profunde striato punctatis, punctis subtransversis, interstitiis convexis, nitido, vix punctulatis.

L. 1¼ lat. ⅝ lin. Inde or.

Die Art dürfte wegen der spitzen Hinterecken des Halsschildes kaum zur Gattung gehören.

Basides crassicornus Motschulsky.

Basides crassicornus MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 474.

Statura et color *B. ruficolli*, sed duplo minor; breviter ellipticus, convexus, nitidus, rufo-testaceus, elytrorum basi fascioque dilatato medio oculisque nigro-piceis; capite postice bicornuto, cornubus crassis, conicis,

erectis; thorace transverso, punctulato, angulis posticis rectis; elytris profunde striatis striis lateraliter distincto punctatis, interstitiis subconvexis, fere glabris. L. 1⅛ lt ⅜ lin.

Plus grande, et proportionellement plus large que notre *Alphitophagus 4-pustulatus* Steph. Ind. or.

Basides octomaculatus Motschulsky.

Basides octomaculatus MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 474.

♀. Statura et magnitudine *Alphitophagi 4-pustul.* sed paulo latior; breviter ellipticus, convexus, nitidus, rufo-piceus; elytrorum sutura, striga media maculisque tribus postice, ore antennis pedibusque rufo-testaceis; elytris subtiliter punctato-striatis. L. ¾ lt. ⅜ lin. Ind. or.

Basides ziczac Motschulsky.

Basides ziczac MOTSCHULSKY, Bull. Soc. Imp. Nat. Mosc. 42 (1873) 475.

Statura *Alph. 4 pustulatus* sed latior et major; breviter ellipticus, convexus, nitidus, piceus, thoracis marginis, ore palpis, antennis pedibusque plus minusve rufo-testaceis; elytris dilute testaceis, tenue nigro-bifasciatis; fascia antica M-formis, postica triramosa; thorace subtransverso, subtiliter dense punctulato, antice arcuato, angulis posticis acutis; elytris punctato-striatis, punctis transversis. L. 1 lt. ⅜ lin. Ind. or.

Diese Art ist zweifellos *Microcrypticus scriptipennis.*

Platydema unicolor Chevrolat.

Platydema unicolor CHEVROLAT, Pet. Nouv. Ent. 2 (1877) 222.

L. 6¼ lt. 3½ mm. Ovale, supra convexum griseo-villosum, nigro-opacum, coriaceum; labro, labio margineque clypei rufis; capite plano, declivi, minutissime coriaceo, antice semicircuiter sulcato, antennis nigris, 2 artic. primis rubris, art. 5 ad apicem latis, subquadratis; prothorace antice semicircuiter emarginato, postice supra scutellum modice lateribusque rotundato, antice angustato, angulis 4 rectangulis; scutellum triangulare, elytris latis, convexis, tenue striatis, intus distincte punctatis, margine reflexis; interstitiis amplis; corpore infra pedibusque nitidis, punctulatis. Ceylon, Haag.

Diese Art müsste an dem behaarten Körper sofort zu erkennen sein.

Platydema holosericeum Marseul.

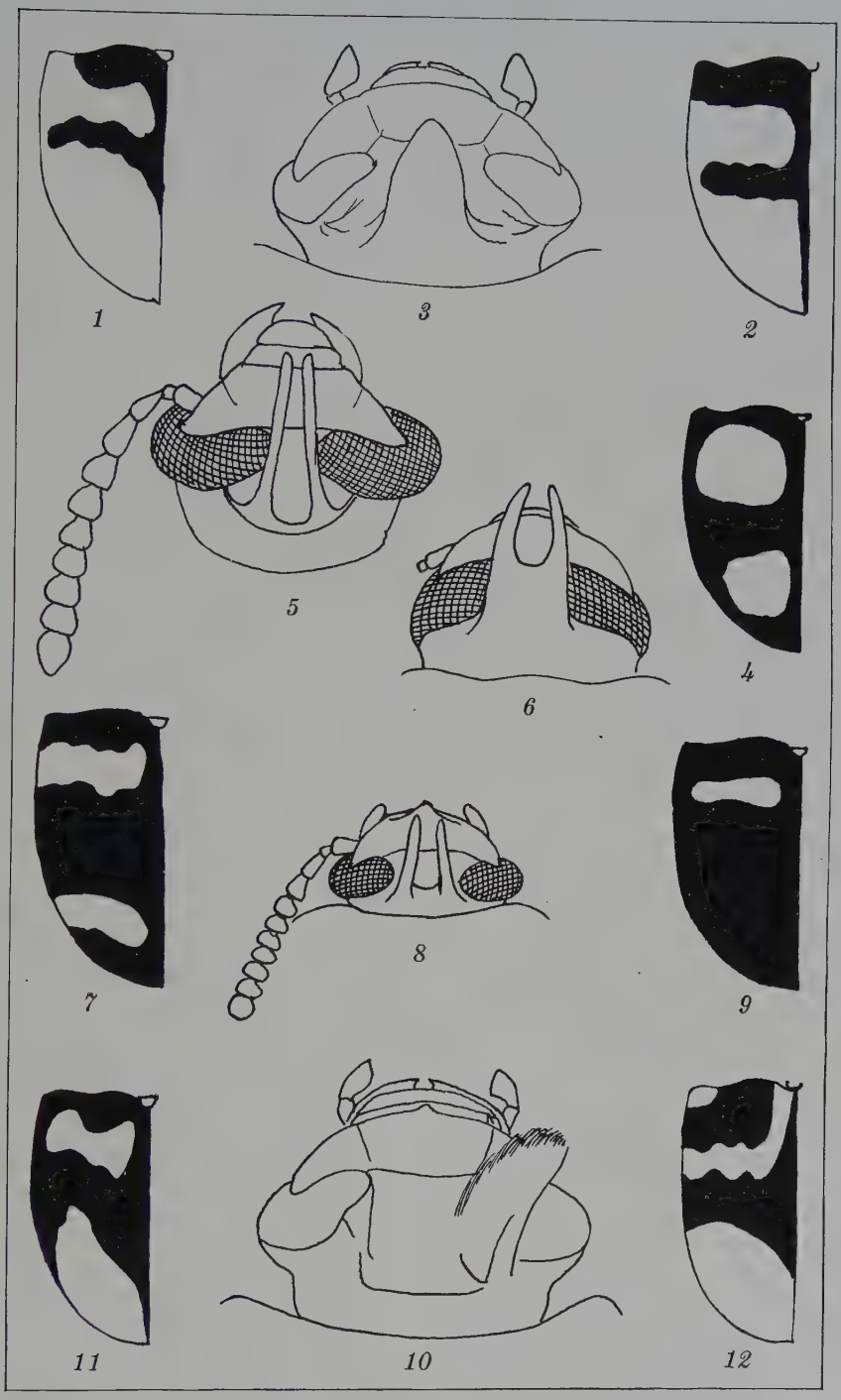
Platydema holosericeum MARSEUL, Ann. Soc. Ent. Fr. V 6 (1876) 108.

Un autre du continent indien (Maratao), plus petit et un peu moins large (9 sur 5 mill.), s'en distingue par une couleur d'un noir brun luisant en dessous, palpes, bouches, antennes et pattes rouge ferrugineux; à ses antennes courtes, composées d'articles très-élargis dès le 4°, tête à peine ponctuée; pronotum à angles antérieurs encore plus courts, subarrondis, imponctué et sans impressions basales; striés des élytres assez bien marquées de points fins, subenfoncées en dehors, avec les interstries convexes.

ILLUSTRATION

Tafel 1

Fig. 1. *Platydema pallidicolle* Lewis. Deckenzeichnung.
2. *Platydema waterhousei* nom. nov. Deckenzeichnung.
3. *Platydema monoceros* nom. nov. Kopf des Männchens.
4. *Platydema monoceros* nom. nov. Deckenzeichnung.
5. *Platydema bifasciatum* (Motschulsky). Kopf des Männchens, mehr von vorn betrachtet.
6. *Platydema bifasciatum* (Motschulsky). Kopf des Männchens, mehr von hinten betrachtet.
7. *Platydema bifasciatum* (Motschulsky). Deckenzeichnung.
8. *Platydema furcaticorne* sp. nov. Kopf des Männchens.
9. *Platydema furcaticorne* sp. nov. Deckenzeichnung.
10. *Platydema subfascia* (Walker). Kopf des Männchens.
11. *Platydema subfascia* (Walker). Deckenzeichnung.
12. *Platydema pictipenne* sp. nov. Deckenzeichnung.



TAFEL 1.

INDEX

[New generic and specific names and new combinations are printed in clarendon; synonyms and names of species incidentally mentioned in the text are printed in *italic.*]

A

Acanthaceæ, 54.
Acephalocystis Laennec, 361.
ansa Laennec, 361.
communis Chiaje, 361.
cystifera Laennec, 361.
endogena Kuhn, 361.
eremita sterilis Cruv., 361.
exogena Kuhn, 361.
granosa Laennec, 361.
granulosa Chiaje, 361.
humana Ludersen, 361.
intersecta Laennec, 361.
macaci Cobb., 362.
ovis tragelaphi Cobb., 362.
ovoidea Laennec, 361.
prolifera Chiaje, 361.
prolifera socialis Cruv., 361.
simplex Goodsir, 361.
suilla Ludersen, 361.
surculigera Laennec, 361.
Acicnemis filicornis Hub., 94.
Acroschismus Pierce, 238.
Addia, 135.
Adichosia, 399.
Albizzia saponaria Blm., 174.
ALEXANDER, CHARLES P., New or little-known Tipulidæ from the Philippines (Diptera), II, 71.
Alphitobius, 450–452.
dermestoides Fairm., 451.
Alphitophagus, 134.
4-pustulatus Steph., 593.
subfascia Walk., 563.
Alysiidæ, 88.
Alysiinæ, 88.
Amarygmus, 576.
Anastellorrhina Bigot, 397, 398, 400.
bicolor Bigot, 399.
Andes Stål, 201, 214.
angulatus Muir, 216.
bakeri Muir, 218.
bicolor Muir, 221.
brunneus Muir, 210, 213, 215.
brunniceps Muir, 213.
cucullatus Muir, 218, 219.
decoloratus Muir, 203.
distinctus Muir, 220.
dubiosus Muir, 212.
elongatus (Dist.), 223.
Andes Stål—Continued.
fictus Muir, 207.
furcatus Muir, 210, 213, 215.
geometrinus (Dist.), 223.
humeralis (Walk.), 222.
inaequalis Muir, 217.
indistinctus Muir, 217.
inornatus (Dist.), 223.
insolitus Muir, 219.
lamononi (Muir), 222.
maculifrons Muir, 208.
marmoratus (Uhler), 214.
meander (Walk.), 222.
migratorius (Dist.), 223.
mindanaensis Muir, 216.
mitellatus Muir, 219.
nexus (Walk.), 221.
nubilus (Walk.), 222.
ocellatus Muir, 222.
oldi Muir, 201.
ornatus Muir, 208.
parvus Muir, 210.
plagosus (Dist.), 223.
pseudobrunneus Muir, 213, 215.
pulchellus Muir, 209.
pulchra (Muir), 222.
quadrilaminatus Muir, 206.
serratus Muir, 205.
serrulatus Muir, 215.
simplex Muir, 203.
spinosus Muir, 207, 208.
stramineus Muir, 211.
tortricomorphus (Kirk.), 222.
tridentatus Muir, 206.
undulatus Stål, 201, 214, 216-218.
unifasciatus Muir, 211, 212.
usitatus Muir, 214, 215.
variolosus (Dist.), 223.
vitiensis (Kirk.), 222.
Anisocara Geb., 136, 139, 140, **143.**
Ankylostoma, 490.
Anoglyphis Foerster, 92.
Anoplocephala E. Blanch., 495.
magna, 495.
mamillana (Mehlin), 495, 496, 503.
perfoliata (Goeze), 495, 496, 503.
Anthicomorphus Lewis, 515, 531.
atronotatus Pic, 534.
consimilis Krekich-Strassoldo, 533.
fumeoalatus Krekich-Strassoldo, 533.

Anthicomorphus Lewis—Continued.
glaber Krekich-Strassoldo, **534.**
infuscatus Krekich-Strassoldo, **532,** 533.
montanus Krekich-Strassoldo, **533,** 534.
niponicus Lewis, 534.
rufescens Krekich-Strassoldo, **532.**
rufus, 532.
sulcatipennis Pic, 534.
(Walesius ?) rufus Krekich-Strassoldo, **531.**
Anthicus, 531.
Anthophora borneensis Ckll., 171.
cingulata (F.), 171, 172.
cingulifera Ckll., 171.
korotonensis Ckll., 170.
samarensis, 172.
subcaerulea, 171.
walkeri, 171.
whiteheadi Ckll., 171.
whiteheadi borneensis, 171.
whiteheadi samarensis Ckll., & LeVeque, **170.**
zonata, 171.
Apanteles angustibasis Gahan, **85.**
Apis binghami Ckll., 175.
indica nigrocincta Sm., 175.
Apocynaceæ, 50.
Aquifoliaceæ, 31.
Ardea cinerea, 419.
Arduenna strongylina (Rudolphi), 229, 231.
Argina cribraria, 109.
Ascaris, 489, 493.
equorum Goeze, 495, 496, 503.
lumbricoides Linn., 227, 228, 231.
Asclepiadaceæ, 53.
Asobara, 88.
antipoda Ashm., 88.
orientalis Viereck, 88.
Aspidopteris elliptica Juss., 175.
Athysanus coronatus Berg., 537.
coronatus Dist., 537.
harrarensis Baker, 537.
kumaonis Baker, 537.
similis Kbm., 537.
similis Mel., 537.
Astoma acephalocystis Goodsir, 361.

B

Bacillus coli, 2, 4, 300, 302, 312, 317, 319-321, 323, 324.
dysenteriæ, 2-6.
dysenteriæ Shiga, 1.
leprae, 466, 474, 476, 479.
pyocyaneus, 318.
Bacterium coli, 304.
Bactrocera umbrosa Fabr., 89.
BAKER, C. F., Nomenclatorial notes on the Jassoidea, IV, 537.
Basanopsis, 135.
Basanus Lac., 136, 140-142, 144, 424.
apicalis Geb., **144, 148,** 151.
celebensis Geb., **144, 151.**
erotyloides Lewis, 144, 147.
Basanus Lac.—Continued.
erotyloides Lewis var. annamitus Geb., **147.**
forticornis Dej., 144, 145.
hellus Geb., **144, 152,** 154.
javanus Chevr., 145-149.
longior Geb., **145, 146.**
misellus Geb., **144, 153.**
philippinensis Geb., **144, 147.**
pictus Geb., **144, 149.**
sumatranus Geb., **147.**
sumatrensis Geb., **145.**
Basides Motsch., 542, 560.
bifasciatus Motsch., 559.
crassicornus Motsch., 560, 592.
octomaculatus Motsch., 593.
picicollis, 560.
plagiatus Motsch., 560.
ruficolli, 592.
rufopiceus Motsch., 561.
ziczac Motsch., 560, 593.
Bauhinia Linn., 25.
pachyphylla Merr., **25.**
Bdellolarynx, 189.
sanguinolentus Austen, 189.
Bees from Samar, Philippine Islands, 169.
Bengalia lateralis Macq., 183.
BITTERMAN, THEODORE, *see* CALLENDER and BITTERMAN.
Boletophagus Lac., 131, 132.
costulatus Fairm., 132.
Bombus americanorum (Fabr.), 120.
irisanensis, 116.
pennsylvanicus Degeer, 120.
Booponus intonsus Aldrich, 407.
Brachymeria Westw., 90.
excarinata Gahan, **90.**
hirtifrons Ashm., 90.
ovata Say, 90.
prodeniae Ashm., 90, 91.
Braconidæ, 83.
Bremus bakeri, 115.
eximius var. *tonkinensis,* 115.
folsomi Frison, 116.
irisanensis (Ckll.), 115, 116, 118-120.
irisanensis var. baguionensis Ckll., 116, 118-120.
mearnsi (Ashm.), 113-116, 120.
mearnsi var. bakeri Ckll., 113, 115, 116, 120.
Brixia, 221.
elongata Dist., 223.
geometrina Dist., 223.
humeralis Walk., 222.
inornata Dist., 223.
meander (Walk.) Dist., 222.
migratoria Dist., 223.
nubila (Walk.) Dist., 222.
plagosa Dist., 223.
subfasciata Stål, 222.
variolosa Dist., 223.
Brixidia, 223.
Bumblebees of the Philippine Islands, 113.
Byrsax, 138.

C

Caesalpinia Linn., 162.
nuga Ait., 163.
sepiaria Roxb., 163.
szechuensis Craib., 163.
tsoongii Merr., **162.**
CALLENDER, G. R., and THEODORE BITTERMAN, An epidemiological study in leprosy, 9.
Callimomidæ, 89.
Calliphora Robineau-Desvoidy, 397, 402, 406.
aucta Walk., 398.
augur Linn., 193, 399-403.
aureonotata, 401.
aureopunctata Macq., 194, 401.
australis Boisd., 399.
bicolor Bigot, 400.
clausa Macq., 401.
croceipalpus Jaenn., 187, 401.
dasyopthalma Macq., 399.
dichromata Bigot, 400.
dispar Macq., 181, 399, 401.
dorsalis Walk., 400.
erythrocephala Meig., 398, 401.
fulviceps v. d. Wulp., 398.
hilli Patton, **400, 402.**
hortona Walk., 194.
hyalipennis Macq., 193, 399, 401.
icela Walk., 194.
laemica Walk., 399.
lateralis Macq., 400.
oceaniae Robineau-Desvoidy, 400.
ochracea Schiner, 193, 399.
parasacra Speiser, 187, 401.
pellucidus, 181.
pubescens Macq., 399, 401.
quadrimaculata Swed., 182, 399, 401.
ruficornis Walk., 399.
rufifacies Guer.-Men., 194.
rufipes Macq., 399, 401.
rufiventris Bigot, 400.
rufiventris Macq., 400.
sacra F., 399.
segmentaria, 401.
selasoma Erichs., 400.
stygia F., 399, 400, 402.
tessellata Macq., 401.
testaceifacies Macq., 399.
tibialis Macq., 400, 402.
vicarians Schiner, 187, 401.
villosa Robineau-Desvoidy, 399.
violacea Walk., 399.
vomitoria Linn., 398.
xanthuria Bigot, 400.
Calymmus Pasc., 131.
Canthigasteridæ, 167.
Carruthersia Seem., 51.
axilliflora Merr., **51.**
Cassida, 126, 128.
bakeri Spaeth, **125.**
basilana Spaeth, **126, 128.** 129.
dysphorica Spaeth, **129.**
Catops sericeus, 590.
Cechenosternum Geb., 592.
Celastraceæ, 32.
Ceraphronidæ, 109.
Ceraphroninæ, 109.
Ceraphron manilae Ashm., 109.
Ceratina philippinensis Ashm., 172.
Cerocephala (Parasciatheras) dinoderi Gahan, 100.
Ceropria Cast. & Br., 136, 138, 140, **143,** 257, 572.
amplipennis Geb., **260,** 266, **267,** 269-271.
anthracina, 257.
axillaris Chevr., 258.
bifasciata Chevr., 261, 283, 286.
bifoveata Fairm., 287.
caesarea Geb., **261,** 270, **278.**
chrysosticta Hope, 258, 262.
decolorata Geb., **259, 265,** 269, 271.
dolorosa Fairm., 261, 274, 280, 282, 283.
erythrocnema Cast. & Br., 258, 263, 264, 270, 287.
femorata Motsch., 258, 259, 264, 287.
festiva Cast. & Br., 262, 279.
formosana Geb., 260, 267, 269, 271.
hoppei Gory, 277.
humeralis Har., 258, 261.
impressifrons Fairm., 258, 263.
induta Wied., 257, 259–261, 265, 267, 271–277, 280–282, 287, **570.**
induta subsp. subocellata Cast. & Br., 260.
induta var. **purpurina** Geb., **260,** 274, **277.**
insignis Chevr., 258, 287.
intermedia Har., 258, 288.
iris Chevr., 258.
laticollis Fairm., 260, 273–275.
laticollis Fairm., subsp. schenklingi Geb., 260, 274.
medanensis Geb., **261, 269,** 271.
mindanaica Geb., **260, 272.**
mindorense, 274, 283.
mindorensis Geb., **261, 282.**
nepalensis Sturm, 277.
opulenta Har., 260, 269, 272, 273, 277.
paykulli Dalman, 262.
posticalis Motsch., 287.
pulchra Hope, 258.
pyritosa Geb., **261, 269, 270.**
romandi, 257.
rufofasciata Fairm., 261, 286.
salga Pasc., 286.
serripes Geb., **261, 284,** 286.
speciosa Kl., 277.
speciosissima Geb., 259, 265.
striata Lewis, 259.
subnigra Geb., **261,** 281.
subocellata, 271, 273–276.
sulcifrons Har., 259, 267, 269, 271, 276.
superba Wied., 258, 259, 262, 263.
tristis Har., 261, 280, 282.
versicolor Cast. & Br., 258, 259, 262, 263, 279, 287.
vidua Geb., **261, 286.**
violacea Blanch., 258.
yris Chevr., 288.

Cestoda, 495.
Chalcididæ, 90.
Chalcidinæ, 90.
Chalcidoidea, 89.
Chalcis Fabr., 90.
Chariotheca, 258.
Chinese plants, new species of, 161.
Chirida, 127.
cruciata L., 127.
elatior Klug, 127.
Chlorination of the Manila water supply, 297.
Chrysomyia Robineau-Desvoidy, 184, 405.
albiceps var. *putoria*, 185, 194, 408, 409. 411.
annulipes Patton, 410, 411.
bezziana Villeneuve, 180, 406-408.
duvaucellii Robineau-Desvoidy, 180.
dux Eschsch., 179, 180.
flaviceps Macq., 179, 180.
fulvipes Patton, 410, 411.
incisuralis Macq., 403, 409.
laxifrons Villeneuve, 405.
macellaria, 406.
megacephala F., 180, 193, 406-408.
micropogon, 406-408.
rufifacies Macq., 408.
varipes Macq., 409-411.
villeneuvei Patton, 405, 409.
(*Lucilia*) cyaneocincta Bigot, 180.
(*Lucilia*) cyanescens Loew, 180.
(*Lucilia*) *dines* Bigot, 180.
(*Lucilia*) *flaviceps* Macq., 180.
(*Lucilia*) *javana* Schiner, 180.
(*Lucilia*) *saffranea* Bigot, 180.
(*Musca*) *bata* Walk., 180.
(*Musca*) *dux* Eschsch., 180.
(*Musca*) *remuria* Walk., 180.
(*Somomyia*) *erythroopina* Bigot, 180.
(*Somomyia*) *pfeifferi* Bigot, 180.
Cinnamomum Tournef., 23.
loheri Merr., 23.
mercadoi Vid., 24.
Citrus, 175, 243, 254.
aurantifolia, 253.
aurantium, 253.
excelsa, 245, 248, 253, 254.
hystrix, 249, 251, 252.
maxima, 253.
mitis, 253.
sinensis, 253.
Cixius meander Walk., 222.
nexus Walk., 221.
nubilus Walk., 222.
Clausena Burm. f., 27.
anisum-olens (Blco.) Merr., 27.
loheri Merr., 27.
Cleonymidæ, 91.
Cleonyminæ, 91.
Cnaphalocrocis medinalis Guenée, 86, 91.
COCKERELL, T. D. A., and NORMA LE VEQUE, Bees from Samar, Philippine Islands, 169.
Compsomyia dux, 407.
Coptocycla, 126-128.
Cossyphus, 138.
Cotyleceps Uhler, 201, 214.
marmorata Uhler, 201, 214.
CRAM, ELOISE B., *see* SCHWARTZ and CRAM.
Crypticus detersus Walk., 583.
Cryptocarya R. Br., 24.
loheri Merr., 24.
oblongata Merr., 25.
Cryptolucilia, 402.
(*Pseudopyrellia*) *lauta*, 185.
Ctenochira, 127.
Cyclopodia Kolenati, 413.
albertisi, 415.
ferrarii, 415.
greefi, 415.
horsfieldi de Meij., 413, 415.
oxycephala, 415.
sykesi, 414, 415.
Cylicostomum Railliet and Henry, 495, 499, 500.
bicoronatum (Looss), 501, 503.
calicatum (Looss), 501, 503.
catinatum Looss, 501.
coronatum (Looss), 501, 503.
euproctus (Boul.), 501, 503.
goldi, 501, 503.
goldi var. tridentatum (Yorke and Macfie), 501.
insigne (Boul.), 500, 503.
leptostomum Kotlan, 501, 503.
longibursatum Yorke and Macfie, 501, 503.
nassatum var. parvum Yorke and Macfie, 500, 503.
pseudocatinatum Yorke and Macfie, 500, 503.
tridentatum, 501.
Cyrtoneura Macq., 184.
Cysticercus cellulosae (Gmel.), 227, 228, 231. 351.
echinococcus (Zeder) Koeberle, 362.
tenuicollis (Rudolphi), 227, 228, 231.

D

DE LEON, WALFRIDO, and LAMBERTO LEIVA, Echinococcus cyst of the human lung, 351.
Deltocephalus bimaculatus Gill. and Baker, 537.
bimaculatus Mel., 537.
capitatus Dist., 537.
capitatus Mats., 537.
ceylonensis Baker, 537.
distanti Baker, 537.
fraternellus Baker, 537.
fraternus Ball, 537.
fraternus Mats., 537.
littoralis Ball, 537.
littoralis Mats., 537.
matsumuri Baker, 537.
Derispia, 135.
Diaclina, 135, 428, 549.
Diaperinæ, 134.
Diaperis Linn., 134, 136, 140, 142, 154.
boleti, 155.
ceylonica Chevr., 156.

Diaperis Linn.—Continued.
coccinea, 154.
lewisi Bates, 155.
lewisi var. intersecta Geb., 155.
maculata Oliv., 154.
niponensis Lewis, 155.
rubrofasciatus Reitter, 155.
sanguineipennis Bates, 155, 156.
sanguineipennis var. **sinensis** Geb., **155, 156.**
velutina, 586.
Dicranomyia (Alexandriaria) **brevissima** Alex., **71.**
Dilleniaceæ, 36.
Dimorphocalyx Thw., 30.
denticulatus Merr., 31.
loheri Merr., **30.**
Dinoderus minutus Fabr., 85, 102.
Diodontidæ, 167.
Diphyrrhynchus, **135.**
Diplycosia Blm., 44.
loheri Merr., **30.**
Diptera of medical and veterinary importance: I, Types of older authors in continental museums, 177; II, The more important blowflies, Calliphorinæ, 397.
Pupipara from the Philippine Islands, 413.
Diskostoma acephalocystis Goodsir, 361.
Disturbances of cutaneous sensibility in leprosy, 445.
Donax cannaeformis K. Schum., 173.
Dynopsylla robusta Crawf., 103.
Dysantinæ Geb., **131.**
Dysantes Pasc., 131, 132.
biluna Walk., 134.
elongatus Redtenbach, 133, 134.
taurus Pasc., 133.
Dysoxylum Blm., 28.
loheri Merr., **28.**
robinsonii Merr., 29.

E

Echinococcus Rudolphi, 361, 363.
alveolaris R. Blanch., 362.
arietis E. Blanch., 361.
cerebralis Perroncito, 362.
cerebri Spiering, 362.
cyst of the human lung, 351.
cysticus Huber, 362.
endogena (Kuhn) Leuck., 362.
giraffae Gerv. (?), 362.
granulosus (Batsch) Rudolphi, 351, 361.
hepatis, 362.
hominis (Zeder) Rudolphi, 361.
hydatidosus R. Leuck., 362.
infusorium F. S. Leuck., 361.
intercranialis Fricke, 362.
lienis Kehlberg, 362.
mesenterii Surman, 362.
multilocularis Leuck., 362.
multilocularis exulcerans Huber, 362.
multilocularis hepatis Haffter, 362.
multiplex Stiller, 362.
osteoklastes Huber (?), 362.
Echinococcus Rudolphi—Continued.
pardi Huxley, 362.
polymorphus Diesing, 360–362.
pulmonum Huppert, 362.
racemosus Leuck., 362.
retroperitonialis Bitter, 362.
scoliciparіens Kuchenmeister, 362.
simiae Rudolphi, 361.
simplex Leuck., 362.
subphrenicus Huber, 362.
unilocularis Huber, 362.
veterinorum Rudolphi, 361.
Echinokokkus, 362.
Effects of castration on immature guinea pigs, 325.
Elasmidæ, 102.
Elasmus philippinensis Ashm., 102.
Elatostema Forst., 161.
sessile Forst., 162.
stewardii Merr., **161.**
Embelia Burm. f., 45, 166.
hainanensis Merr., **166.**
loheri Merr., **45.**
luzoniensis Merr., 46.
tsjeriam-cottam A. DC., 46, 166.
Emberiza sulfurata, 420.
Enanea Lewis, 135, 142.
Encyrtidæ, 99.
Encyrtinæ, 99.
Encyrtus barbatus Timberlake, 99.
Endophloeus angustatus, 132.
flexuosus Soland., 132.
Entedoninæ, 102.
Ericaceæ, 43.
Eriocera **cinereithorax** Alex., **73.**
thrax Fabr., 102.
Erioptera (Baeoura) **semicincta** Alex., **74.**
Erythroneura apacha Baker, 537.
bipunctata Gill., 537.
bipunctata Mel., 537.
dorsalis Gill., 537.
dorsalis Horvath, 537.
kansana Baker, 537.
lawsoni Baker, 537.
scutellaris Gill., 537.
scutellaris Herrich-Schaeffer, 537.
Eucyrtus, 135, 278.
Eugenia Linn., 39.
cordatilimba Merr., **40.**
crassilimba Merr., **41.**
disopyrifolia Merr., **39.**
megalophylla Merr., **42.**
merrillii C. B. Rob., 42.
sargentii Merr., 40.
subrotundifolia C. B. Rob., 41.
Euglypta **bakeri** Mos., **69.**
Eulophidæ, 102.
Eupelmidæ, 94.
Euphorbiaceæ, 30.

F

Fagraea Thunb., 49.
loheri Merr., **49.**
obovata Wall., 49.
racemosa Jack., 174, 175.

Fallacy of the test for lactose fermenters as an indicator of fæcal pollution of waters, 317.
FERRIS, G. F., Third report upon Diptera Pupipara from the Philippine Islands, 413.
Flacourtiaceæ, 37.
Fomes, 136.
amboinensis (Lam.) Fr., 137.
gibbosus Nees, 137.
nigrolacatus, 136.
obliquus Pers., 137.
pectinatus Klotzsch, 137.
rufoflavus B. and C., 137.
Foot rot of various citrus species as root stocks, resistance to, 243.
Formicomus Krekich-Strassoldo, 515, **520.**
Formicomus Laferte, 516.
aestimabilis Krekich-Strassoldo, 516.
albopictus Krekich-Strassoldo, **518.**
ambiguus Krekich-Strassoldo, **519.**
angustipennis Pic, 516.
appendicinus Krekich-Strassoldo, **521.**
armatus Boh., 519.
bakeri Krekich-Strassoldo, **519,** 520.
bhutanensis Pic, 516.
bifasciatus Pic, 516, 520.
bispinosus Krekich-Strassoldo, **518.**
borneensis, 516.
brahminus Laferte, 515, 519.
castaneus Krekich-Strassoldo, **526.**
excavatus Krekich-Strassoldo, **519.**
gratiosus Krekich-Strassoldo, **523.**
himalayanus Krekich-Strassoldo, 516.
iliganensis Krekich-Strassoldo, **525.**
infuscatus Krekich-Strassoldo, **524,** 525.
insignis Krekich-Strassoldo, **517, 519.**
intrusus Krekich-Strassoldo, **525.**
lagenicollis Fairm., 516.
latipennis Pic, 516.
longiceps Pic, 516.
longithorax Krekich-Strassoldo, **522.**
lucidulus Krekich-Strassoldo, **528.**
lucidus Krekich-Strassoldo, **527.**
manillanus Pic, 528.
maximus Pic, 517.
microphthalmus Krekich-Strassoldo, **528.**
montanus Krekich-Strassoldo, 516.
niger Pic, 529.
obscurus Pic, 519, 523, 524, 526–528.
parvulus Krekich-Strassoldo, **529.**
penangensis Krekich-Strassoldo, **524.**
philippinensis Pic, 527.
primitivus Krekich-Strassoldo, **520,** 521.
pygidialis Pic, 527.
robustipes Pic, 522.
rösseleri Pic, 522, 523, 526–528.
simplex Krekich-Strassoldo, **521.**
sphinx Krekich-Strassoldo, 521.
terminatus Pic, 523.
vethi Krekich-Strassoldo, 520.
FRISON, THEODORE H., The bumblebees of the Philippine Islands (Bremidæ: Hymenoptera), 113.

G

GAHAN, A. B., A second lot of parasitic Hymenoptera from the Philippines, 83.
Garcinia Linn., 37.
loheri Merr., **37.**
rubra Merr., 37.
Gargariscus, 292.
Gargilius, 139, 141.
Garrulus glandarius, 419.
Gasterophilus intestinalis, 190.
lativentris Loew, 190.
nigricornis Loew, 190.
veterinus, 190.
GEBIEN, HANS, Die Tenebrioniden (Coleoptera) des indo-malayischen Gebietes, unter Berücksichtigung der benachbarten Faunen: IV, Die Gattungen Phloeopsidius, Dysantes, Basanus, und Diaperis, 131; V, Die Gattung Ceropria, 257; VI, Die Gattungen Ischnodactylus, Hoplocephala, und Martianus, 423; VII, Die Gattung Platydema, 539.
Gelonium Roxb., 30.
philippinense Pax & K. Hoffm., 30.
stenophyllum Merr., **30.**
Geranomyia cornigera Alex., 71.
(Geranomyia) cornigera Alex., 71.
Glossinella shillingsi Grünberg, 189.
Glycyphana aethiessida White var. **immaculata** Mos., **69.**
rubroscutellaris Mohn. var. **immarginicollis** Mos., **69.**
rubroscutellaris Mohn. var. **nigroscutellaris** Mos., **69.**
Glyxerus Pasc., 131.
Gnathostoma hispidum Fedtchenko, 230, 231.
Gulaphallus Herre. **508.**
eximius Herre, **509,** 511.
mirabilis Herre, **509,** 511.
Guttiferæ, 37.
Gyalocephalus Looss, 498.
capitatus (Looss), 498, 499, 503.
equi, 498.
Gymnodontes, 167.
Gymnostachyum Nees, 54.
trichosepalum Merr., **54.**
Gyrostigma (*Spathicera*) *meruensis* Sjöstedt, 187.

H

Habronema Diesing, 501.
megastoma (Rudolphi), 501–503.
microstoma (Schneider), 501–503.
muscae (Carter), 501–503.
Hades rufolimbatus, 578.
tenebrosus, 578.
Haematobia lutosa Grünberg, 189.
nudinervis Stein, 189.
rufipes, 189.
sanguisugens Austen, 189.
stimulans Meig., 189.
Halictoxenos manilae Pierce, 235.
robbii Pierce, 235.

Halictus robbii Ashm. 235.
(*Evylaeus*) *manilae*, 235.
Harpullia Roxb., 35.
arborea (Blco.) Radlk. var. **megalocarpa** Merr., **35.**
HAYASAKA, I., Magellania dickersoni, a new species of brachiopod, 61.
Helminth parasites of hogs in the Philippine Islands, 227.
Hemicera, 135.
zigzaga Mars., 258.
Heminodus, 292.
HERRE, ALBERT W. C. T., A suplement to poisonous and worthless fishes, 167; A new Philippine sea robin, family Peristediidæ, 291; Two strange new fishes from Luzon, 507.
Hippoboscidæ, 415.
Hister inaequalis, 140.
Histeropsis, 539.
dermestoides Chevr., 450, 451.
Homalium Jacq., 37.
obovatum Merr., **37.**
panayanum F.-Vill., 38.
polillense Merr., **38.**
subscandens Elm., 38.
villosum Merr., 39.
Hookworm campaign in Cebu, 483.
Hoplocephala Cast. & Br., 134, 136, 139, 143, 448, 450, 451, 550, 569.
asiatica Lewis, 448.
ferruginea Motsch., 448, 547, 548.
haemorrhoidalis, 448.
longula Geb., 450.
orientalis Geb., 448, 547.
tricornis Geb., **449.**
Horse parasites collected in the Philippine Islands, 495.
HUSTACHE, A., Curculionides nouveaux des Philippines et l'Orient, 371.
Hydatigena granulosa Batsch, 361.
Hydatis erratica Blumenbach, 361.
Hyostrongylus rubidus (Hassall & Stiles), 228–231.
Hypophloeus, 451.

I

Ichneumonoidea, 83.
Idotasia **bakeri** Hustache, **377.**
semirubra Hustache, **378.**
Ilex Linn., 31.
buergeri Miq., 31, 32.
loheri Merr., **31.**
Indo-Malayan Tenebrionidæ, 131, 257, 423, 539.
Ischnodactylus Chevr., 135, 136, 139–141, 143, 423, 556.
bakeri Geb., **425, 437.**
batesi Chevr., 423, 424, 426, 432, 441.
bimaculatus Geb., **425, 437,** 438.
bisbifasciatus Geb., 423, **425, 446,** 448.
bisetiger Geb., 423, **426, 440.**
colon Geb., 423, **425,** 426, 427, **428,** 430, 437.
Ischnodactylus Chevr.—Continued.
fenestratus Geb., **426, 436,** 437.
formosanus Geb., 423, **424, 445.**
gradatus Geb., 423, **425, 431.**
immaculatus Geb., 423, **424, 426.**
loripes, 423, 424, 427, 428.
mirabilis Geb., 139, 423, 426, 427, **432,** 434, 440, 441, 445.
nasutus Geb., **425, 434,** 438.
pictipennis Geb., **424, 446.**
quadridentatus Chevr., 441.
quadrioculatus Chevr., 423, 426, 432, 436, 437, 441, 444, 448.
rubromarginatus Chevr., 423, 425, **429,** 432, 437.
sexguttatus Geb., 423, **426,** 432, **438,** 443, 448.
sumbawicus Geb., 423, **424,** 437, **443.**
tetradymus Fairm., 424.
trigonalis Geb., **426, 433,** 438.
unifasciatus, 423, **424, 444,** 446.

K

Kokoonia Thw., 32, 33.
luzoniensis Merr., **32.**
KREKICH-STRASSOLDO, H., Anthicidæ of the Philippines, I, 515.
KUSAMA, HIROSHI, A note on the viability of Bacillus dysenteriæ, 1.

L

Labidocera Geb., 135, 136, 138, **142.**
Lagerstroemia Linn., 165.
limii Merr., **165.**
subcostata Koehne, 165.
Lauraceæ, 23.
Lechria, 73.
bengalensis Brun., 73.
philippinensis Alex., **72.**
LEE, H. ATHERTON, The comparative resistance to foot rot of various citrus species as root stocks, 243.
Leguminosæ, 25, 162.
Leirioessa Kirk., 201.
lamononi Muir, 222.
meander (Walk.) Muir, 222.
nubila (Walk.) Muir, 222.
pulchra Muir, 222.
tortricomorpha Kirk., 201, 222.
vitiensis Kirk., 222.
LEIVA, LAMBERTO, *see* de LEON and LEIVA.
Leprosy, an epidemiological study in, 9.
LE VEQUE, NORMA, *see* COCKERELL and LE VEQUE.
Limnobiinæ, 71.
Linociera Sw., 48.
coriacea Vid., 49.
phanerophlebia Merr., **48.**
Lithurgus scabrosus (Sm.), 172.
Lobotrachelus **affinis** Hustache, **384.**
bakeri Hustache, **379.**
bertrandi Hustache, **382.**
elongatulus Hustache, **381.**
himalayanus Hustache, **382.**

Lobotrachelus—Continued.
luteofasciatus Hustache, 381.
minutus Hustache, 379.
parvulus Hustache, 383.
pectoralis Hustache, 384.
pusillus Hustache, 383.
rufirostris Hustache, 385.
suturalis Hustache, 380.
Loganiaceæ, 49.
Lucilia Robineau-Desvoidy, 185, 402, 406.
albiceps var. *putoria* Wied., 193.
argyricephala Macq., 185, 193, 404.
caesar Linn., 403–405, 409.
chrysocephala, 409.
cuprina Wied., 193, 403–405.
cyaneo-marginata Bigot, 404.
fergusoni Patton, 403, 405.
inducta Walk., 404.
inscribens Walk., 404.
ispida Erichs., 193.
japonica Bigot, 404.
jeddensis Bigot, 404.
leucodes Frauenfeld, 193.
marginifera Walk., 193, 404.
nebulosa Bigot, 404.
nesiotis Schiner, 193, 404.
nosocomiorum Doleschall, 193, 403–405.
pachymosa Bigot, 404.
pavonia Schiner, 193.
pulchra Wied., 182, 183.
rufifacies Guer.-Men., 409.
rufipes, 399.
selasoma Erichs., 193.
serenissima Walk., 185, 193, 404.
sericata Meig., 403–405, 409.
tasmaniensis Froggatt, 404.
Lynchia Weyenbergh, 415.
maura (Bigot), 416, 420.
Lyperosia minuta, 189.
Lythraceæ, 165.

M

Macracanthorhynchus hirudinaceus Pallas, 230, 231.
Macrotomoderus ruficolor Pic, 530.
Macroxenos Schultze, **238.**
piercei Schultze, 235, **238.**
Magellania, 61–63.
dickersoni Hayasaka, 61, 63, 64.
septigera, 63.
(*Waldheimia*) *raphaelis*, 62.
(*Waldheimia*) *septigera*, 62.
MANALANG, C., A hookworm campaign in Cebu, 483.
Martianus Fairm., 136, 143, 450.
castaneus, 450.
dermestoides Chevr., 136, 451.
Mecynotarsus, 515.
Mecysmoderes luzonicus Hustache, **395.**
Megachile atrata Sm., 172.
atratiformis, 172.
lachesis Sm., 172.
lachesis nigrolateralis Ckll., 172.
metallescens Ckll., 172.
subrixator Ckll., 172.
Meliaceæ, 28.
Melicope triphylla Merr., 172, 175.
Meliosma Blm., 164.
cuneifolia Franch., 165.
dilleniaefolia Hook. f., 165.
myrianthum S. & Z., 165.
stewardii Merr., **164.**
Melodinus Forst., 52.
cuningii A. DC., 53.
lanceolatus Merr., 52.
Menephilus, 138.
Menimus Sharp, 135–137, 142.
kraepelini, 137.
rugicollis, 137.
MERRILL., ELMER D., New species of Philippine plants collected by A. Loher, 21; Five new species of Chinese plants, 161.
Mesotrichia canaria Ckll. & LeVeque, **174**, 175.
chlorina Ckll., 173, 174.
ghilianii Grib., 174, 175.
nigroplagiata, 174.
philippinensis, 173, 174.
philippinensis samarensis Ckll. & LeVeque, **173.**
vachali Perez, 174.
Metaclisa, 134.
Metapelma albisquamulata End., 96.
atrotegularis Gahan, 94, 96, 97.
gloriosa Westw., 94.
rufimana Westw., 94, 96.
speciosa Gahan, 96.
tenuicrus Gahan, 95.
Metastrongylus, 227.
elongatus (Dujardin), 229, 231.
salmi Gedoelst, 229.
Metriona, 127, 128.
bakeri, 127.
basilana, 127.
dysphorica, 127.
elatior, 127.
manilensis, 127.
quinquemaculata, 127.
Microcalliphora, 409.
Microcrypticus scriptipennis Fairm., 560, 591, 593.
Microgasterinæ, 85.
Microlynchia, 415.
Micromelum Blm., 26.
caudatum Merr., **26.**
curranii Elm., 27.
Microsporon furfur, 474.
Mimosa pudica Linn., 169–172, 174, 175.
Molidæ, 167.
Morellia hortensia Wied., 192.
MOSER, J., New Philippine Cetoniidæ, 69.
MUIR, F., The genus Andes Stål (Cixiidæ: Homoptera), 201.
Musca, 177, 183, 186, 187, 191, 398.
aethiops Stein, 187, 194, 198, 199.
albiceps Wied., 192, 193.
albina Wied., 192, **197.**
albomaculata Macq., 184, **197.**
albomaculata Villeneuve, 198.

Musca—Continued.
alpesa Walk., 191, 198, 199.
analis Macq., 196.
angustifrons Thoms., 187, 196.
antiquissima Walk., 196.
aurifacies Robineau-Desvoidy, 195.
australis Boisd., 183, 186, 195, 198.
autumnalis De Geer, 185, 199.
bakeri Patton, 198.
beckeri Schnabl, 197.
bezziana, 182.
bezzii Patton & Cragg, 185, 198.
biseta Hough, 196.
bivittata Thoms., 186, 196.
calleva Walk., 196.
campestris Robineau-Desvoidy, 195.
campicola Robineau-Desvoidy, 195.
chiliensis Macq., 195.
chloropyga Wied., 184.
cingalaisina Bigot, 184, 199.
conducens Walk., 196.
congolensis Villeneuve, 198, 199.
convexifrons, 184, 196, 198.
corvina Froggatt, 181, 187, 195, 196, 199.
corvina vivipara Ports., 199.
craggi Patton, 198.
crassirostris Stein, 188, 191, 192, 199, 200.
cuprea Macq., 196.
cuprina Wied., 185.
cyaneocincta, 193.
dasyops Stein, 194, 198.
determinata Walk., 196.
dichotoma Bezzi, 196.
divaricata Awati, 196.
domestica Linn., 180, 181, 186, 187, 195.
dorsomaculata Macq., 184, 197.
dorsomaculata Villeneuve, 198.
euteniata Bigot, 196.
fasciata Stein, 188, 197.
fergusoni Johnston and Bancroft, 186, 198.
flaviceps Macq., 193.
flavifacies Bigot, 196.
flavinervis Thoms., 187, 196.
flavipennis Bigot, 196.
fletcheri Patton & Senior-White, 199.
frontalis Rondani, 195.
gabonensis Macq., 187, 198, 199.
gibsoni Patton & Cragg, 198.
gymnosomea Rondani, 196, 197.
hervei Villeneuve, 198.
hilli Johnston and Bancroft, 198.
hortensia Wied., 192.
hottentota Robineau-Desvoidy, 195.
humilis Patton, 183, 191, 192, 196.
humilis Wied., 184, 196.
illingworthi Patton, 198.
incerta Patton, 196.
inconstans, 191.
indica Awati, 199.
inferior Stein, 188, 189, 199,
interrupta Walk., 187, 197.
javana Schiner, 193.

Musca—Continued.
jejuna F., 182, 183.
kasauleensis Awati, 198.
laemica Walk., 183.
larvipara Schnabl and Dziedzicki, 199.
lasiopthalma Thoms., 187, 197.
lateralis Macq., 195.
latifrons Wied., 185, 191, 196.
latiparafrons Awati, 198.
lauta Wied., 185.
ligurriens Wied., 185, 193.
lucens Villeneuve, 197.
lucidula Loew, 188, 197.
ludifica F., 181, 195, 199.
lusoria Bezzi, 198, 199.
lusoria Stein, 198.
lusoria Wied., 185, 187, 198.
marginalis Wied., 184.
mediana Wied., 184, 191, 196.
megacephala F., 179, 182, 183.
mesopotamiensis Patton, 198.
minor Macq., 195.
minor Patton, 196.
modesta de Meij., 199, 200.
multispina Awati, 196.
munda Wied., 184.
nana Meig., 196.
natalensis Villeneuve, 199.
nebulo F., 179, 183, 186, 196.
nigrithorax Stein, 198.
niveisquama Thoms., 186, 196.
osiris Wied., 192, 197.
pampasiana Bigot, 196.
pattoni Austen, 198.
pellucens Meig., 195.
phasiaeformis Meig., 197.
planiceps Wied., 184, 199.
pollinosa Stein, 188, 189, 199.
praecox Walk., 196.
prashadi Patton, 198.
pulla Bezzi, 198.
pumilla Macq., 186.
pumilla Patton, 196.
pungoana Karsch., 188, 198.
putoria, 182, 183, 192, 193.
ripara Robineau-Desvoidy, 195.
rivulans Robineau-Desvoidy, 195.
rufifacies Macq., 193.
rufiventris Macq., 197.
rutescens Walk., 404.
sacra F., 182.
scapularis Rondani, 196.
senior-whitei Patton, 199.
setigera Awati, 184.
sorbens Wied., 183–187, 191, 196.
sordissima Walk., 196.
spectanda Wied., 187, 191, 196, 198.
speculifera Bezzi, 197.
spinohumera Awati, 198.
spinosa Awati, 198.
stomoxidae Robineau-Desvoidy, 195.
stygia F., 183..
sugillatrix Robineau-Desvoidy, 197.
tempestatum Bezzi, 196, 197.

Musca—Continued.
tempestiva Fallen, 196.
terrae-reginae Johnston & Bancroft, 198.
umbraculata F., 181, 195.
vagatoria Robineau-Desvoidy, 195.
ventrosa Wied., 184, 188, 192, 198.
vetustissima Walk., 186, 187, 196.
vicaria Walk., 196.
vicina Macq., 187, 196.
vicina Robineau-Desvoidy, 195.
villeneuvei Patton, 197.
viridaurea Wied., 184.
vitripennis Meig., 192, 197.
xanthomela Walk., 184, 198.
xanthomelas Wied., 184, 186, 198.
yerburyi Patton, 196.
Muscina, 184.
Mychestes Pasc., 131.
Myrsinaceæ, 45, 166.
Myrtaceæ, 39.

N

Nangka, 89.
Nanophyes **bakeri** Hustache, **374.**
bellus Hustache, **374.**
fulvipes Hustache, **372.**
fulvoapicalis Hustache, **376.**
griseus Hustache, **372.**
insularis Hustache, **373.**
ligatus Heller, 375.
testaceicornis Heller, 374.
violacea Heller, 376.
Necator, 490.
Nematoda, 496.
Neocalliphora, 397-399.
Neomida, 539.
Neopollenia, 399.
Neostethus, 508, 510.
Nomenclatorial notes on the Jassoidea, IV, 537.
Nomia iridescens Sm., 169.
levicauda Ckll., 170.
longitarsis Ckll., 170.
mimosae Ckll. & LeVeque, **170.**
strigata (F.), 170.
Notoxus, 515.
Nycteribiidæ, 413.

O

Ochromyia incisuralis Macq., 409.
Œsophagostomum dentatum (Rudolphi), 228, 231.
Oleaceæ, 48.
Onesia, 401.
Oodera gracilis, 97.
obscura Westw., 97.
ornata Gahan, **97.**
rufimana Westw., 97.
Opiinæ, 86.
Opius **lepidus** Gahan, **86.**
philippinensis Ashm., 86.
Orchestes **anoploideus** Hustache, **371.**
Orcopagia Pasc., 131.
Ornitheza Speiser, 418.
metallica (Schiner), 419, 420.
Ornithoctona, 418.
Orthauchen Krekich-Strassoldo, **516.**
Oxyuris equi (Schrank), 495, 496, 503.
Ozolais Pasc., 131.

P

Palaquim Blco., 46.
elliptilimbum Merr., **46**, 48.
glabrum Merr., 47.
loheri Merr., 47.
Pangagud, 488.
Papilio sp., 100.
Paracalliphora, 399, 400.
Parasciatheras caelebs Masi, 100.
Parasitic Hymenoptera from the Philippines, 83.
Parsonsia R. Br. 50.
oblancifolia Merr., 51.
oblongifolia Merr., **50.**
Parta, 137.
PATTON, W. S., Diptera of medical and veterinary importance: I, Types of older authors in continental museums, 177; Diptera of medical and veterinary importance, II. The more important blowflies, Calliphorinæ, 397.
Pavetta Linn., 55.
loheri Merr., **55.**
Peltoides, 424.
Pentaphyllus Latr., 134, 136, 139, 140, 142, 449.
biconiger, 139.
strictus, 142.
Peristedion Lacép., 292.
rieffeli Kaup., 292, 294.
welchi Herre, 292.
Peristèthus Kaup, 292.
Peristrophe Nees, 54.
caudatifolia Merr., 54.
lancifolia Merr., 55.
Phaenocarpa (Asobara) **bactrocerae** Gahan, **88.**
Phallostethidæ, 507.
Phallostethus, 508, 510.
Phanurus Thoms., 105, 106.
angustatus, 106.
dignus Gahan, 108.
emersoni Girault, 106.
flavipes Ashm., 106.
floridanus Ashm., 106.
ovivorus Ashm., 106.
rowani Gahan, **106**, 108, 109.
tabanivorus Ashm., 106.
Philaematomyia insignis Austen, 199.
gurneyi Patton & Cragg, 199.
Philippine Anthicidæ, 515.
bumblebees, 113.
Cetoniidæ, 69.
Curculionidæ, 371.
Diptera, 413.
plants collected by A. Loher, 21.
sea robin, a new, family Peristediidæ, 291.
Phloeopsidius Geb., **131.**

Phumosia dichromata Bigot, 401.
xanthuria, 401.
Phyllanthus, 87.
Phytophthora terrestria, 244.
Pilea Lindl., 23.
benguetensis C. B. Rob., 23.
loheri Merr., 23.
Pintalia Stål, 201, 214.
Platydema Cast. & Br., 134, 136, 139–141, 143, 151, 424, 446–448, 450, 451, 539, 540, 560.
alticorne Gravely, 544.
annamitum Fairm., 545, 583, 586.
aries, 140, 562, 563, 565.
asymmetricum Champ., 542, 545, 562, 563, 575.
aurimaculatum Gravely, 542, 547, 558.
bifasciatum Motsch., 542, 546, 547, 559, 562.
biimpressum Chevr., 448.
caesifrons, 592.
capreolum Chevr., 544, 575.
catopioides Fairm., 578, 590, 591.
celebum Chevr., 563.
chalceum Geb., **543, 572.**
coeruleum Geb., **543, 570, 573.**
detersum (Walk.), 545, 578, 583, 588.
detersum Walk. var. **rubripes Geb., 584, 586.**
diversidens Fairm., 563.
feae Geb., 558.
ferrugineum Chevr., 448, 541, 547.
flavopictum Geb., 541, 546, 549, 568.
formosanum Geb., 545, 588, 590.
fumosum, 589.
furcaticorne Geb., 542, 547, 561.
fuscicorne Chevr., 589, 590.
haemorrhoidale Geb., 544, 575.
haemorrhoidalis, 140.
hemisphaericum, 578.
hieroglyphica Fairm., 591, 592.
higonicum Lewis, 544.
higonium Lewis, 576.
holosericeum Mars., 586, 593.
japanum Mars., 563.
javanicum Geb., 543, 569.
javanus, 151.
laticorne Fairm., 545, 578, 583.
lynceum Lewis, 544, 571–573.
maculicolle Cast. & Br., 545, 578, 581, 583, 585, 586.
malaccum Mars., 136, 545, 578, 583, 584, 586, 588.
marseuli Lewis, 136, 139, 544, 570, 573, 574, 577.
moerens Perty, 545, 578, 581, 583.
monoceros Geb., 542, 546, 556, 558.
musivum Har., 578.
nigroaeneum Har., 577.
nigroaeneum Motsch., 544, 577, 578.
novae-guineense Geb., 558.
ochracea Motsch., 592.
orientale Geb., 448.
Platydema Cast.—Continued.
orientalis, 143.
pallidicolle Lewis, 136, 541, 546, 551-553, 556.
perpolitum Geb., 541, 546, 554.
picicolle Motsch., 563.
pictipenne Geb., 543, 546, 567.
pilosiventre Geb., 541, 546, 550.
plagiatum Motsch., 542, 546, 547, 560.
plagiatum Waterh., 541, 547, 553.
planum Geb., 541, 546, 549–551.
polyspila Fairm., 592.
quadrispilotum Chevr., 546, 550.
recticorne Lewis, 542–544, 573, 575.
reflexum Chevr., 544, 578, 580.
ribbei Geb., 542, 547, 558.
rubromarginatum, 556.
ruficolle Motsch., 543, 546.
rufopiceum Motsch., 542, 545, 561.
sauteri Geb., 544, 571–573.
seminitens Chevr., 543, 547, 562, 565, 575.
semirufa Fairm., 591.
sericans Fairm., 578, 591.
sericeum Geb., 542, 543, 545, 562, 563, 575.
sodale Waterh., 541, 546, 551, 552.
subfascia (Walk.), 136, 542, 543, 547, 554, 558, 560, 562, 563, 567, 568, 575.
subfascium, 563.
sulcipenne Geb., 543, 547, 562, 565, **566,** 575.
sumatranum Geb., 541, 546, 555.
sylvestre Lewis, 543, 571, 573.
tarsale Chevr., 586, 588.
tetraspilotum Chevr., 542, 556.
tetraspilotum Hope, 556.
timorense Mars., 578, 580.
timorensis, 580.
tricornutus, 140.
tricuspis Motsch., 136, 544, 578, 580, 586, 588.
umbratum Mars., 544, 578, 581, 586.
undulatum Westw., 591.
unicolor Chevr., 593.
valgum Pasc., 545.
velutinum Walk., 540, 545, 580, 586, 588, 589.
violacea, 592.
waterhousei Geb., 136, **541, 547, 553,** 555, 556.
waterhousei **var. dohrni Geb., 554.**
(*Crypticus*) *detersum* Walk., 586.
(*Histeropsis*) *quadrispilotum*, 431.
Pleurotropis fraternus (Motsch.), 102.
Podagrioninæ, 89.
Podagrion Spin., 89.
ashmeadi Crawf., 90.
philippinensis Crawf., 90.
sinensis (Walk.), 90.
Poisonous and worthless fishes, a supplement to, 167.
Pollenia tasmanensis, 401.
villosa Robineau-Desvoidy, 183.
viridiventris, 401.

Polycephalus echinococcus Zeder, 361.
granosus Laennec, 361.
granulosus (Batsch) Zeder, 361.
hominis Zeder, 361.
humanus Zeder, 361.
Polygalaceæ, 29.
Polyporus, 136, 559.
auberianus Mont., 137.
betulinus Bull., 137.
cupreus Berk., 137.
gilvus Schwein., 137.
plebejus Berk., 137.
tabacinus Mont., 137.
Poncirus (*Citrus*) *trifoliata*, 243.
Poteriostomum Quiel, 499.
imparidentatum Quiel, 499, 503.
pluridentatum Quiel, 499.
ratzii (Kotlan), 499.
Pratobombus Vogt, 116, 119.
Pristirhynchomyia lineata Brun., 196.
Probstmayria vivipara (Probstmayr), 496, 503.
Proekon, 399.
Prophanurus, 104.
coccivorus, 104.
flavicorpus Gahan, 104.
pacificus Gahan, 104.
Pselliophora, 71, 78.
bakeri Alex., 77.
idalia (O. S.), 78.
mcgregori Alex., 78.
Pseniclea castanea Hustache, 377.
violacea (Heller), 376.
Psilostoma, 409.
Pteromalidæ, 99.
Pteromalinæ, 99.
Pteromalus luzonensis Gahan, 99.
puparum Linn., 99, 100.
Pteropus alecto, 413.
hypomelanus enganus, 413.
philippinensis, 413.
speciosus, 413.
vampyrus, 413.
vampyrus lunensis, 413.
sp., 413.
Ptilolepis inferior Stein, 199.
Pycnetron Gahan, 91.
curculionidis Gahan, 93.
Pyrellia, 402.

Q

Quercus, 118.

R

RAMIREZ, JOSE, *see* SCHÖBL and RAMIREZ.
Randia Houstoun, 56.
loheri Merr., 56.
microcarpa (Bartl.) Merr., 56, 57.
Rauwolfia Linn., 50.
loheri Merr., 50.
verticillata Baill., 50.
Rhamnaceæ, 35.
Rhipidius scutellaris Heller, 235.
Rhynchium atrum Sauss., 235–239.
RODRIGUEZ, JOSE N., The disturbances of cutaneous sensibility in leprosy, 455.
Rosa, 118.
Rubiaceæ, 55.
Rubus, 118.
Rutaceæ, 26.

S

Sabiaceæ, 164.
Sageretia Brongn., 35.
hamosa Brongn., 35.
Sapindaceæ, 35.
Sapotaceæ, 46.
Saurauia Willd., 36.
clementis Merr., 36.
loheri Merr., 36.
Scaphidema Redtenbach, 134–136, 138, 143.
metallicum, 152.
Scelionidæ, 104.
SCHÖBL, OTTO, and JOSE RAMIREZ, The fallacy of the test for lactose fermenters as an indicator of fæcal pollution of waters, 317.
Schoenobious incertellus Walk., 108, 109.
SCHULTZE, W., Macroxenos piercei (order Strepsiptera), a new genus and species of wasp parasites of the Philippine Islands, 235.
SCHWARTZ, BENJAMIN, Helminth parasites of hogs in the Philippine Islands, 227.
SCHWARTZ, BENJAMIN, and ELOISE B. CRAM, Horse parasites collected in the Philippine Islands, 495.
Semiathe cribricollis Hustache, 385.
Serphoidæ, 104.
Seteria equina (Abildgaard), 502, 503.
Simulium, 188.
Siphonodon Griff., 33.
pyriformis Merr. var. parvifolius Merr., 33.
Smicra, 90.
Smiera Spin., 90.
SPAETH, FRANZ, Zwei neue Cassida-Arten aus den Philippinen, 125.
Spalangiinæ, 100.
Spathiinæ, 83.
Spathius Nees, 83.
dinoderi Gahan, 84.
exarator Linn., 83.
fuscipennis Ashm., 84.
philippinensis Ashm., 83, 84.
Spiloscapha Bates, 136, 138, 140, 143.
Staphyleaceæ, 33.
Stegomyia fasciata, 178.
Stephanurus dentatus Diesing, 227, 229, 231.
Stomoxys bilineata Grünberg, 190.
brunnipes Grünberg, 190.
glauca Grünberg, 190.
inornata Grünberg, 190.
korogwensis Grünberg, 190.
nigra Macq., 190.
ochrosoma Speiser, 187.
sellata Grünberg, 190.
Strepsiptera, 238.

Strongylus Mueller, 495, 497.
edentatus (Looss), 497, 503.
equinus Mueller, 497, 503.
tetracanthus Mehlis, 500.
vulgaris (Looss), 497, 503.
Styringomyia, 77.
flavocostalis Alex., **76.**
marshalli Edwards, 77.
SUMULONG, MANUEL D., Effects of castration on immature guinea pigs, 325.

T

Tabanus borealis, 181.
javanus, 181.
striatus, 181.
Taenia, 351.
cateniformis, 361.
cucumerina Bloch, 361.
echinococcus Sieb., 361.
"*echinokokkus*" Schneidemuhl, 361.
granulosa (Batsch) Gmel., 361.
hydatigena Pallas, 227, 228.
nana Beneden, 361.
serrata, 361.
solium Linn., 228.
visceralis socialis granulosa Goeze, 361.
(*Arhynchotaenia*) *echinococcus* Diesing, 361.
(*Echinococcifer*) *echinococcus* Leuck, 361.
(*Echinococcus*) *echinococcus* Railliet, 361.
TAYLOR, EDWARD, Notes on the chlorination of the Manila water supply, 297.
Telenominæ, 104.
Telenomus Haliday, 105, 106.
benefactor Crawf., 106.
gowdeyi Crawf., 106.
kingi Crawf., 106.
tabani Mayr, 106.
Telephæ Pasc., 396.
carinirostris Hustache, 386, 389.
ferruginipes **Hustache**, 386, **390.**
grisea Hustache, 386, 390.
griseofasciata Hustache, 386, 388.
lineolata Hustache, 386, 391.
maculithorax Hustache, 386, 394.
minuta Hustache, 386, 389.
neglecta Hustache, 386, 394.
nigricornis Hustache, 386, 393.
obtusata Hustache, 386, 387.
ornata Hustache, 386.
ornata var. diffusa Hustache, 387.
pusilla Hustache, 386, 392.
striata Hustache, 386, 392.
ursula Heller, 389.
Tenebriomimus Kolbe, 450.
adansoniarum Kolbe. 450.
Tetragonomenes, 135.
Tetraodontidæ, 167.
Tetrastichus, 102.
clypeatus Gahan, 102.
Teucholabis **confluenta** Alex., **75.**
quinquemaculata Alex., 74.
Thelychaeta Br. & Berg., 184.
Tipula, 81.
Tipulidæ from the Philippines (Diptera), II. new or little-known, 71.
Tipulinæ, 77.
Tipulodina cinctipes (de Meij.), 81.
joana (Alex.), 81.
luzonica Alex., **79.**
nipponica (Alex.), 81.
pedata (Wied.), 81.
Tomoderus **bakeri** Krekich-Strassoldo, **530.**
fumeoalatus Krekich-Strassoldo, **530.**
Trachyscelis, 138.
Trematoda, 495.
Trichonema tetracanthus Railliet, 500.
Trichuris, 493.
suis (Schrank), 230, 231.
Tricocalliphora, 399.
Trigona biroi Friese, 175.
Triodontidæ, 167.
Triodon Reinw., 168.
bursarius Reinw., 168.
macropterus Lesson, 168.
Triodontophorus Looss, 498.
brevicauda, 498.
intermedius Sweet, 498, 503.
minor (Looss), 498, 503.
serratus, 498.
tenuicollis, 498.
Turpinia Vent., 33.
pachyphylla Merr., **33.**
pomifera DC., 34.
simplicifolia Merr., **34.**
Two strange new fishes from Luzon, 507.
Tylophora R. Br., 53.
lancilimba Merr., **53.**
Typhlocyba australis Froggatt, 537.
australis Walsh, 537.
dubia Dist., 537.
dubia Fieber, 537.
dubiosa Baker, 537.
froggatti Baker, 537.

U

Uncaria Schreber, 57.
acida Roxb., 57.
luzoniensis Merr., **57.**
Urticaceæ, 23, 161.

V

Vaccinium Linn., 43.
platyphyllum Merr., 44.
rizalense Merr., **43.**
Vesicaria granulosa (Batsch) Schrank, 361.
Viability of Bacillus dysenteriæ, a note on the, 1.
Viola, 118.

W

Waldheimia, **62.**
lenticularis, 62.
Walesius theresae Pic, 532.

Williamsia Merr., 58.
glabra Merr., 58.
loheri Merr., 58.
stenophylla Merr., 59.

X

Xanthophyllum Roxb., 29.
excelsum (Blm.) Miq., 29, 30.
glandulosum Merr., 29.
loheri Merr., 29.
multiramosum Elm., 29.
Xenidæ, 238.
Xeninæ, 238.
Xylocopa amethystina "F." Grib., 173.
collaris, 173.
euchlora, 174, 175.
Xylocopa—Continued.
fuliginata Perez, 172, 173.
fuliginata var. indecisa Ckll. & LeVeque, 172.
ignita Sm., 173.
indecisa, 173.
maesoi Dusmet, 174.
mazarredoi, 173.
nigrocaerulea Sm., 173.
nigroplagiata Ritsema, 174.
philippinensis, 174.
samarensis, 174.

Z

Zwei neue Cassida-Arten aus den Philippinen, 125.